THE AUSTRALIAN NATIONAL UNIVERSITY

The Australian National University

Centre for Economic Policy Research

DISCUSSION PAPER

Tax Reform, Targeting and the Tax Burden on Women

Patricia Apps

DISCUSSION PAPER NO. 609

May 2009

ISSN: 1442-8636
ISBN: 978 1 921262 90 6

Patricia Apps, University of Sydney Law School, Australian National University, UTS and IZA

Paper prepared for National Foundation for Australian Women for submission to the Review of Australia's Future Tax System

Abstract

In the early 1980's Australia had a highly progressive, individual based income tax and families received support for dependent children in the form of universal family allowances. The introduction of income tests for child support payments based on family income (now in the form of Family Tax Benefit Part A), together with changes in the rate scale applying to personal income, have had the effect of replacing Australia's progressive *individual* based income tax with a system that tends towards one of joint taxation under a rate scale that exhibits an inverted U-shaped profile – the highest marginal rates apply to average incomes, and to the incomes of the second earner in the family. This paper shows how the introduction of this new income tax system has shifted the overall burden of taxation towards families with two-earners on low and average wages and to working married mothers in particular as second earners. The paper proposes a return to a progressive individual based income tax and universal family payments for dependent children, for reasons of both fairness and efficiency, and argues for the elimination of policy instruments that create complexity and serve only to reduce the transparency of tax reform.

JEL-Classification: D91, H24, H31, I38, J16, J22

Keywords: Income taxation, Family benefits, Time allocation, Labour supply, Household production, Discrimination

1 Introduction

The global economic crisis will probably signal the end of a period dating from the early 1980's that has been characterised by a single-minded belief, held even by many policy makers, in the desirability of leaving markets to operate in accordance with the self interest of the dominant market participants. A corollary of this is the view that public regulatory systems interfere with the process of wealth creation and should be dismantled, that "government interference" should be eliminated, and that top entrepreneurs and financiers, as well as the capital they control, are highly mobile between countries and so are very sensitive to taxation and regulation.

The same ideology has underpinned policy towards the labour market, the overall outcome of which has been an increase in earnings inequality, due not only to the dramatic rise in pay levels at the top but also to the growth of a group of workers characterised as the "working poor". Wages for these workers are so low that the incomes earned from full time work are insufficient to maintain a family with dependent children above a poverty level standard of living.

In this paper we argue that the tax policy response to the growth in family and child poverty over the period has been driven by the same ideology that has led to the collapse of the international finance markets. Consistent with the view that high income earners and the capital they control are highly mobile, tax reform over the period has been directed towards reducing taxes at high income levels by shifting the tax burden, including the burden of supporting families in poverty, lower down the income distribution. The analysis in this paper identifies the way in which this has been achieved by a succession of complex but carefully planned reforms that have fundamentally changed the rate structure of the income tax and family support systems.

In the early 1980's support for dependent children was provided in the form of universal family allowances funded by a highly progressive rate scale on personal incomes. Since then the period has seen the following:

- The introduction of income tests for child support payments based on family income.[1] This has had the effect of replacing Australia's progressive *individual* based income tax with a system that closely approximates one of joint taxation under a rate scale that exhibits an inverted U-shaped profile – the highest marginal tax rates apply across average incomes and the incomes of the second earner in the family. The latter is a characteristic feature of joint taxation.

- Significant tax cuts at high income levels together with the expansion of the Low Income Tax Offset (LITO). These policies have contributed to replacing the strongly progressive rate scale applying to personal income with one that is less progressive in general and no longer progressive at all over certain ranges. The withdrawal of the LITO at 4 cents in the dollar above $30,000 creates a new 34 cents rate from $34,000, which then falls to 30 cents once it is fully withdrawn.

The introduction of joint income-tested family payments and the new rate scale on personal incomes has had the effect of funding tax reductions on top incomes and transfers to families at the bottom of the income distribution by raising taxes on the population of earners between these two groups, in a way which bears particularly heavily on the two-earner household and working married mothers. The set of policy measures to achieve this outcome - the Personal Income Tax (PIT) scale in combination with the LITO, the Medicare Levy (ML) and the Family Tax Benefit (FTB) system – have resulted in what appears to be a very complex system. However, the changes amount simply to a change in the rate structure and base of the tax system, which could have been made directly and openly. Such a degree of simplicity and transparency was however apparently not the intention. Similar developments have occurred in other countries, including especially the US and UK.[2]

In this paper, we review the main elements of these changes and their rationalisations and isolate their effects. Income-tested family payments are often supported by the argument that universal payments are necessarily more "costly". It is clear from optimal tax theory however that the idea of achieving a necessary "cost" saving by targeting reflects a misunderstanding of the trade-off between efficiency and equity in tax design. Nevertheless, the idea has been influential in promoting reforms that have

[1] 1983 saw the first step in the process, with the introduction of the "Family Income Supplement" withdrawn on joint income, which has since evolved into Family Tax Benefit Part A excluding the base rate. A series of subsequent reforms have completely eliminated universality.

now completely eliminated universality.[3] For this reason Section 2 explains at some length the error in the logic of the cost saving argument for targeting, drawing on the theory of optimal taxation. The section presents numerical examples that show how the introduction of an income test on a universal payment has the effect of replacing a progressive tax rate scale with one under which the highest marginal rates can apply across average incomes. It is simply a less than transparent reform for shifting the tax burden towards the "middle". We then go on to show how income testing on the basis of joint income shifts the tax burden to low and average wage second earners, and is basically a policy instrument for moving towards joint taxation with high marginal rates across the middle of the distribution of family incomes.

We also know from optimal tax theory that the merits of a particular tax system can be assessed only on the basis of reliable estimates of behavioural responses – changes in labour supply in response to the incentives created by the tax system - and information on household living standards. It is always possible to construct a model that supports a particular direction of reform, or a particular ideology, by specifying an appropriate set of assumptions, but these may or may not be supported by the data, and it is important to check this. It is therefore essential to be familiar with the data. Section 3 provides an overview of the data that are especially relevant for modelling the effects of tax reform in an economy in which most families have two earners, and in which there is a high degree of heterogeneity in the labour supply of the second earner. The section goes on to review briefly the optimal tax literature, focussing on recent contributions that claim results in support of targeting, but which lack consistency with the data. Section 4 presents an empirical analysis of the effects of the PIT scale, LITO, ML and FTB system on the structure of tax rates, and reports results showing the high taxation of women as second earners in low and average wage families. Section 5 contains concluding comments.

[2] See Apps and Rees (2009, Ch 6) for a comparative analysis of the income tax systems of these countries.
[3] As we note later, the view is articulated by the Australian Treasury (2009) in its Consultation Paper, "Australia's future tax system".

2 Tax rates and targeting

The view that universal transfers are more "costly" than income-tested payments appears in the Australian Treasury's Consultation Paper "Australia's future tax system". In discussing Family Tax Benefit Part A (FTB-A), which is withdrawn on joint income, and Family Tax Benefit Part B (FTB-B), which is withdrawn on the second income, the Treasury argues:

"*If the primary purpose of the payment is considered to be part compensation for the direct and indirect costs of having children, it could be argued that they should not be income-tested. While this would lower effective marginal tax rates (EMTRs) … and possibly improve work incentives, it would also be more costly. On the other hand, if the payments are directed at reducing child poverty, arguably they could be more tightly targeted*."

This statement implies that universal benefits are more "costly" than income-tested benefits in terms of net government expenditure. Superficially this seems to be self evident. Giving all households a fixed transfer is clearly more "expensive" in this sense than giving only some households that transfer, while giving all other households either a smaller transfer or none at all. However, the argument fails to understand that any tax system that gives a transfer and then withdraws it at so many cents in the dollar is equivalent to a system with a given universal payment and a particular structure of marginal tax rates.[4] What matters is not the "universality" of the payment, but the actual value of the payment and the structure of marginal tax rates that is adopted. Given the tax revenue requirement that exists, all tax structures that satisfy this are equivalent in terms of "cost" in the sense implied by the quotation. What matters, as is made clear by the theory of optimal income taxation founded by James Mirrlees (1971) and Eytan Sheshinski (1972), is the way in which a particular tax structure trades off fairness of the distribution of tax burdens across households against dead weight welfare losses arising from its effects on work incentives. One tax structure is in this sense more costly than another if, for a given degree of income redistribution, it generates a larger welfare loss because of its greater adverse effects on work incentives. In this sense FTB-A is very probably more costly than a system

[4] Note also that the rationalisation for family payments is not limited to "part compensation for … the costs of having children". Cash and in-kind benefits for children represent important policy responses to an imperfect capital market and to the risks faced by children that are uninsurable in private markets. See Apps and Rees (2002, 2003, and 2009, Chs. 4 and 5) for further discussion and analysis.

of universal payments financed by an individual based progressive income tax.[5] We develop this point at some length in this paper.

This section illustrates the effect of replacing a universal family payment with an income-tested payment using hypothetical examples. We begin, in Section 2.1, with an analysis based on the model of the single-person household that chooses an allocation of time between market work and leisure, as in the optimal tax models of Mirrlees and Sheshinski. Most tax systems are piecewise linear and therefore the Sheshinski model provides the relevant starting point.[6] We present two examples. The first is the linear income tax of the Sheshinski model: all individuals face the same constant marginal tax rate (MTR) and receive the same cash transfer financed from tax revenue. We set out an example that shows what happens to marginal and average tax rates when an income test is applied to the transfer. The second example begins with a progressive marginal rate scale with revenue again used to finance a universal transfer, and illustrates what happens when the transfer is subject to an income test. In both cases, the income test serves only to introduce a new MTR scale that exhibits an inverted-U shaped profile and shifts the tax burden to the "middle". The universal transfer is, in effect, left in place. Appendix A sets out the mathematics of the system.

These examples can, under certain conditions, be interpreted to apply to an economy of single-earner households. However, the traditional single-earner family now represents only a minority of households of prime working age, as shown by the data discussed in Section 3.1. In around two thirds of two-parent families both parents are in the workforce, and of these just under half work full time. From these employment rates it is clear that the labour supply of the second earner, typically the female partner, is significant, but varies widely across households. The data also show that heterogeneity in female labour supply emerges strongly only after the arrival of the first child, reflecting the fact that following this event household production in the form of child care becomes a close substitute for market work and bought-in child

[5] In effect the quotation concedes this point by recognising that the non-targeted system could be better for work incentives.

care. We therefore need to consider an economy of two-earner households where one parent, typically the mother, can choose to allocate time to working at home as a substitute for working in the market. Section 2.2 presents a numerical example for this kind of economy based on a pre-reform progressive tax rate scale and a universal family payment that is withdrawn on joint income. The example illustrates the substantial redistribution of the tax burden from top income earners to low wage working married mothers that can follow the replacement of a universal payment with one withdrawn on joint income.

2.1 The single-person household and targeting

For the purpose of exposition we construct the examples for a hypothetical economy in which average annual incomes rise from $20,000 in quintile 1 (the bottom 20% of the distribution) to $200,000 in quintile 5 (the top 20%), as in Table 1, and where the distribution can be represented by the average in each quintile. The aim of the analysis is to clarify the distributional effects of targeting. We therefore simplify the exposition by assuming there are no behavioural effects, i.e., effects on choice of labour supply. As a further simplification, the calculations are based on a revenue neutral government budget constraint in which the only spending is on cash transfers. This will of course give much lower tax rates than the actual rates required for funding all government spending.

Example 1: Linear income tax and targeting

We define the pre-reform tax system as a *linear income tax* with a MTR of 25 cents in the dollar, as shown in row 1 of Table 2.1. The tax payable at this rate is given in row 2. If there are no behavioural effects, a rate of 25 cents will raise just enough revenue to finance a lump sum transfer of $20,000 for each individual (row 3). The household's tax, calculated as the tax on income less the transfer, is shown in row 4, and the average tax rate (ATR), calculated as the ratio of tax to income, in row 5. The

[6] In contrast, the Mirrlees model is based on the solution to a mechanism design problem and this does not correspond to how taxing authorities approach the tax problem in practice. For further discussion see Section 3.3.

system is progressive because ATRs rise with income.[7] In fact, we have a *negative income tax* up to $80,000.

Table 2.1 Linear income tax

Annual income $pa	**20,000**	**40,000**	**60,000**	**80,000**	**200,000**
1. MTR %	25.0	25.0	25.0	25.0	25.0
2. Tax (rate scale) $pa	5,000	10,000	15,000	20,000	50,000
3. Transfer $pa	20,000	20,000	20,000	20,000	20,000
4. Tax $pa	-15,000	-10,000	-5,000	0	30,000
5. ATR %	-75.0	-25.0	-8.3	0.0	15.0

Targeting the cash transfer

Now suppose the government believes that it can "reduce costs" by withdrawing the transfer of $20,000 at a rate of 25 cents in the dollar above a threshold income of $20,000. The representative individual in quintile 1 still receives the transfer of $20,000. In quintile 2 the transfer falls to $15,000, and continues to fall up to an income of $100,000. In quintile 5 the transfer is zero. The reform halves the amount of tax revenue required for funding cash transfers, and so the government can reduce the MTR to 12.5%.

Table 2.2a shows the new MTR of 12.5 cents in the dollar and the distribution of transfers that can be *reported* by Government. And, with this kind of reporting, the OECD will re-rank the economy as a much lower taxing country. Table 2.2b shows the *true* reform.

Table 2.2a Reported reform

Annual income $pa	**20,000**	**40,000**	**60,000**	**80,000**	**200,000**
1. MTR %	12.5	12.5	12.5	12.5	12.5
2. Transfer $pa	20,000	15,000	10,000	5,000	0

Table 2.2b True reform

Annual income $pa	**20,000**	**40,000**	**60,000**	**80,000**	**200,000**
1. MTR%	12.5	37.5	37.5	37.5	12.5
2. Tax (rate scale) $pa	2,500	12,500	17,500	25,000	45,000
3. Transfer $pa	20,000	20,000	20,000	20,000	20,000
4. Tax $pa	-17,500	-10,000	-2,500	5,000	25000
5. ATR %	-87.5	-25.0	-4.2	6.3	12.5

[7] If the cash transfer were set to zero, we would have a flat rate tax.

The government has, in effect, left the universal transfer of $20,000 in place and replaced the constant MTR of 25 cents in the dollar with a rate scale that exhibits an inverted U-shaped profile across the distribution of income. An individual on an income of up to $20,000 or over $100,000 faces a MTR of only 12.5 cents in the dollar. A much higher MTR of 37.5 cents in the dollar applies to incomes from $20,001 to $100,000.

Rows 4 to 5 of Table 2.2b show the new quintile profiles of household taxes and ATRs. The reform reduces the ATR in quintile 1. The representative individual gains $2,500. In quintile 5 there is a gain of $5,000, twice as much as in quintile 1. The tax reductions at the "top" and "bottom" of the income distribution are financed by higher taxes on the "middle". An individual with an income over $40,000 and under $100,000 pays more tax. The example illustrates how targeting shifts the tax burden towards the "middle" and can be made to look distributionally appealing by providing a small gain to those on very low incomes, especially in an economy with a growing proportion of "working-poor" families.

Example 2: Progressive rate scale and targeting

Now consider the following progressive rate scale: a zero rated threshold up to an income of $20,000, a MTR of 25 cents in the dollar on incomes from $20,001 to $100,000, and a MTR of 50 cents in the dollar on incomes over $100,000. Again, if there are no behavioural responses, tax revenue will be just sufficient to finance a $20,000 universal transfer.

MTRs and tax payable under the rate scale are shown in rows 1 and 2 of Table 2.3 and the transfer, in row 3. Taxes on income, calculated by subtracting the transfer from the tax figure in row 2, are reported in row 4, and ATRs, calculated as the ratio of tax to income, in row 5. As we would expect, the system is more progressive than the linear income tax - ATRs rise more steeply with income due to the progressive rate scale.

Table 2.3 Progressive rate scale

Annual income $pa	20,000	40,000	60,000	80,000	200,000
1. MTR %	0.0	25.0	25.0	25.0	50.0
2. Tax (rate scale) $pa	0.0	5,000	10,000	15,000	70,000
3. Transfer $pa	20,000	20,000	20,000	20,000	20,000
3. Tax $pa	-20,000	-15,000	-10,000	-5,000	50,000
4. ATR %	-100.0	-37.5	-16.7	-6.3	25.0

Targeting the cash transfer

Again suppose the government thinks that it can reduce "costs" by withdrawing the transfer of $20,000 at a rate of 25 cents in the dollar above a threshold income of $20,000. As before, this halves the government's tax revenue requirement. Transfers can now be financed by a MTR scale with rates half those of the pre-reform scale: 12.5% on incomes from $20,001 to $100,000, and 25 cents in the dollar income above $100,000.

Table 2.4a shows the new MTR scale and distribution of transfers that can be *reported* by a Government that wants to claim that it has cut taxes and reduced "middle class welfare". Table 2.4b shows the *true* reform.

Table 2.4a Reported reform

Annual income $pa	20,000	40,000	60,000	80,000	200,000
1. MTR %	0	12.5	12.5	12.5	25.0
2. Transfer $pa	20,000	15,000	10,000	5,000	0

Table 2.4b True reform

Annual income $pa	20,000	40,000	60,000	80,000	200,000
1. MTR %	0.0	37.5	37.5	37.5	25.0
2. Tax (rate scale) $pa	0.0	7,500	15,000	22,500	55,000
3. Transfer $pa	20,000	20,000	20,000	20,000	20,000
4. Tax $pa	-20,000	-12,500	-5,000	2,500	35,000
5. ATR %	-100.0	-31.3	-8.3	3.1	17.5

The government has, in effect, introduced a reform that leaves the universal transfer of $20,000 in place, raises the MTR in quintiles 2 to 4 from 25 to 37.5 cents in the dollar, and lowers the MTR in quintile 5 from 50 to 25 cents in the dollar. Rows 4 to 5 show the new profile of household taxes and ATRs. While the ATR in quintile 1 is unchanged, it rises from quintiles 2 to 4. The additional revenue from taxing the "middle" at a higher rate funds a fall in the ATR in quintile 5, from 25% to 17.5%.

The gain for an individual in quintile 5 is $15,000 - the sum of losses from quintiles 2 to 4.[8]

While the MTRs in row 1 of Table 2.4b are much lower than actual rates (see Figure 4.4a) due to excluding other spending in the government's budget constraint, nevertheless the results serve to illustrate the distributional effect of withdrawing FTB-A payments across single-earner households. It also captures the effect of income-tested tax credit programs in the UK and US.[9]

As noted previously, an important lesson from optimal tax theory is that support for a reform that shifts the tax burden from the top to a lower segment of the income distribution must be based on empirical evidence on wage elasticities. It needs to be shown that labour supply elasticities at the top are sufficiently large and significant that the reform achieves efficiency gains which offset the welfare loss of the rise in inequality. This is recognised by Brewer et al. (2008) in their paper prepared for the Report of the Commission on Reforming the Tax System of the 21st Century, chaired by Sir James Mirrlees (the "Mirrlees Review" of the UK tax system). The authors argue that elasticities at the top are, in fact, much higher than indicated by previous estimates (typically close to zero) on the basis of the observation that gross earnings rose dramatically over a period, from around the mid 1980s, during which top tax rates were reduced. Instead of calculating a labour supply elasticity, i.e., the change in labour supply in response to a change in the net wage, they calculate a gross earnings elasticity, i.e., the change in gross earnings in response to a rise in the net wage, arguing that the rise in incomes at the top (eg., of CEOs in the finance sector) was due to an increase in *effort*, which is unobservable.[10] On the basis of these estimates, and while acknowledging the possibility that the trend in earnings may have been due to reforms of the financial sector made under the Thatcher administration, they make the following recommendation for tax policy:

[8] Unlike the result in Table 2.2, the reform gives nothing to the bottom quintile, and so the welfare lobby would have no incentive to support it. This political obstacle can be removed by combining a revenue neutral increase in the transfer with a higher rate of withdrawal. The effect will be higher MTRs and ATRs in the middle quintiles. However, the bottom will be seen to gain, and so the regressive impact of the change will be less transparent.
[9] See Apps and Rees (2009, Ch. 6).
[10] In other words, while there was little to no evidence of an increase in the labour supply of top earners, their earnings rose due to an increase in (unobserved) effort.

"*… the relevant elasticity of the richest 1% might well exceed 0.25, in which case it is undesirable to increase top METRs [marginal effective tax rates] because doing so would reduce government revenue. We therefore do not propose changes to METRs affecting top incomes*".

The paper appeared before the collapse of the financial sector.

2.2 The two-person household and joint income targeting

To illustrate the effects of targeting on the basis of joint income we consider an economy in which a household can switch from being single-earner, as in the preceding examples, to two-earner - in other words, a household can switch "type" by changing the labour supply of the female partner as second earner. For the purpose of exposition, all households are assumed to have the same demographic characteristics and the same distribution of male and female wage rate pairs. We compare two household "types" in an economy in which there is an equal split between types:

- **Single-earner household**: the male partner works full time in the market and the female works full time at home providing child care and related services using her own time
- **Two-earner household**: both partners work full time in the market and buy in substitute services for child care and home production.

As indicated later in Section 3.1, the data show that the male is typically the primary earner and works full time in the vast majority of families with dependent children. The following discussion is therefore with reference to a model in which male labour supply is fixed.[11]

Example 3: progressive rate scale and joint income targeting

Again we consider an economy in which primary income rises from $20,000 in quintile 1 to $200,000 in quintile 5. The second income is also set at $20,000 in quintile 1 but rises to only $100,000 in quintile 5, as shown in Table 2.5. A progressive, individual based income tax funds a $20,000 transfer to each household.

[11] For a detailed exposition of this model, and the conditions under which it is relevant, see Apps and Rees (2009).

Table 2.5 Pre-reform: progressive rate scale - single and two-earner households

Primary income $pa	**20,000**	**40,000**	**60,000**	**80,000**	**200,000**
1. MTR %	0.0	20.0	20.0	20.0	40.0
2. Tax (rate scale) $pa	0	4,000	8,000	12,000	56,000
3 Transfer: household $pa	20,000	20,000	20,000	20,000	20.000
Second income $pa	**20,000**	**40,000**	**60,000**	**80,000**	**100,000**
4. MTR % on 2nd income	0	20.0	20.0	20.0	20.0
5. Tax $pa	0	4,000	8,000	12,000	16,000

Suppose, initially, that female labour supply is zero and the rate scale shown in Table 2.3 applies: a zero rated threshold up to $20,000, 25 cents in the dollar on incomes for $20,001 to $100,000, and 50 cents thereafter. When the female partner goes out to work in half the population of working age families, the tax base expands and therefore tax revenue rises. Under a revenue neutral system, MTRs can be reduced by 20 per cent. The new rates are 20 cents in the dollar on incomes above $20,000 and under $100,000, and 40 cents in the dollar on incomes above $200,000, as shown in row 1 of Table 2.5.

Note that because the transfer of $20,000 is paid irrespective of employment status, the two-earner household is contributing more to tax revenue in each quintile. The overall result is that the transfer for the single-earner household is partly subsidised by the two-earner household. Thus we see that even under a progressive individual based income tax, the single-earner household gains from the tax revenue collected from the two-earner household.[12] As a result ATRs for single-earner households are below those for two-earner households from quintile 2 to 5, as shown in Table 2.6. Note also that the ATR on the second income is positive from quintile 2.

Table 2.6: Average tax rates

Single-earner household					
1. ATR on h'hold income %	-100.00	-40.00	-20.00	-10.00	18.0
Two-earner household					
2. ATR on h'hold income %	-50.00	-15.00	-3.33	6.40	17.33
3. ATR on 2nd income	0.0	4.00	13.33	15.00	16.00

[12] This point is missed by Brewer el al. (2008) who argue for joint taxation on the basis of the arbitrary assumption that, at any given level of primary income, a two-earner family is better-off because the second earner faces a lower cost of working. Under individual taxation the two-earner family pays more tax at any given level of primary income. Redistribution from two-earner to single-earner couples does not require joint taxation.

Targeting the cash transfer

Again suppose that the government thinks that it can "reduce costs" by withdrawing the transfer of $20,000 at a rate of 25 cents in the dollar above a threshold income of $20,000. However, this time the government defines the income test on *household income*, which is of course still the primary earner's income in the single-earner household, but is the sum of primary and second income in the two-earner household.

The effect of targeting on household income is dramatic. Assuming no behavioural effects, the government can claim a "cost" saving of 65 per cent. Under a revenue neutral reform it can therefore reduce tax rates on income by 65 per cent.[13] Applying a proportional reduction in the pre-reform rates, the government can report a new rate scale of only 7 cents in the dollar on incomes from $20,000 to $100,000 and 14 cents in the dollar on incomes above $100,000, as shown in row 1 of Table 2.7a. The second earner can also be reported as a taxpayer with a rate of only 7 cents in the dollar on an income above $20,000, as shown in row 4 of the table. Rows 1 to 3 report the new regime for the single-earner household. As in Table 2.2a, the transfer for the single-earner is fully withdrawn at an income of $100,000. The bottom quintile is not affected. The middle quintiles lose because the tax gain is less than the transfer loss, and the top quintile gains because the tax gain is greater than the transfer loss.

The negative impact of targeting on low and average wage two-earner households is much greater. Even the bottom quintile loses because the income test is based on household income. Households in which each partner earns only $40,000 for full time work lose $15,000 of the transfer. The negative effects on low and average wage two-earner families can, of course, be concealed by reporting the reform not according to primary income, but on a ranking based on household income. This will allow the two-earner household in quintile 2 of the primary income ranking to be confused with the single-earner household in quintile 4 in which only one partner needs to work full time in the market to earn the same household income, and the household benefits from the output of the second partner in full time household production and child care.

[13] Pre-reform total tax revenue is $100,000. Post-reform cash transfers can be calculated as $(50,000 + (20,000/2)) = $35,000. Thus the surplus is $65,000.

Table 2.7a: Reported reform

Primary income $pa	**20,000**	**40,000**	**60,000**	**80,000**	**200,000**
1 MTR% - primary earner	0	7.0	7.0	7.0	14.0
2. Tax (rate scale) $pa	0	1,400	2,800	4,200	19,600
3. Transfer: single-earner hh $pa	20,000	15,000	10,000	5.000	0.0
Second Income $pa	**20,000**	**40,000**	**60,000**	**80,000**	**100,000**
4. MTR% – 2nd earner	0	7.0	7.0	7.0	7.0
5. Tax (rate scale) $pa	0.0	1,400	2,800	4,200	5,600
6. Transfer: two-earner hh $pa	15,000	5,000	0	0	0

Table 2.7b: True reform

Primary income $pa	**20,000**	**40,000**	**60,000**	**80,000**	**200,000**
1 MTR% - primary earner	0	32.0	32.0	32.0	14.0
2. Tax (rate scale) $pa	0	6,400	12,800	19,200	39,600
3. Transfer: single-earner hh $pa	20,000	20,000	20,000	20,000	20,000
Second Income $pa	**20,000**	**40,000**	**60,000**	**80,000**	**100,000**
1. MTR scale – 2nd earner	25.0	32.0	7.0	7.0	7.0
2. Tax (rate scale) $pa	5,000	11,400	12,800	9,200	5,600

Table 2.7b reports the tax parameters of the *true* reform. The government has introduced a reform that leaves the transfer of $20,000 in place, raises the MTR in quintiles 2 to 4 from 20 to 32 cents in the dollar, and lowers the MTR in quintile 5 from 40 to 14 cents in the dollar, on primary income. The tax parameters for primary income are those that apply to the single-earner household. In the case of the two-earner household, the reform denies the second earner a zero rated threshold. She faces a MTR of 25 cents in the dollar on an income up to $20,000, of 32 cents in the dollar on an income from $20,000 and up to the income level at which the transfer is fully withdrawn. Thereafter the MTR falls to 7 cents in the dollar. As a result, the tax burden on the second earner rises from zero to $5,000 in quintile 1, from $4,000 to 11,400 in quintile 2, and from $8,000 to $12,800 in quintile 3. This shift in the tax burden towards low and average wage two-earner families is reflected in the new ATRs shown in Table 2.8.

Table 2.8: Average tax rates post reform

Single-earner household					
1. ATR %	-100.00	-34.00	-12.00	1.00	9.80
Two-earner household					
2. ATR %	-12.50	-2.75	4.67	5.25	8.40
3. ATR on 2nd income	25.00	28.50	21.33	11.50	5.60

The additional revenue from taxing the "middle" and low and average wage two-earner households at higher rates funds a fall in the ATR in quintile 5, from 18% to 9.8% in the case of the single-earner household, and from 17.33% to 8.4% in the case of the two-earner household.

This example gives some indication of the highly specialised and counterfactual assumptions, especially on the contribution of household production and child care to family welfare,[14] which would be required to support the withdrawal of family payments on the basis of joint income. An optimal tax model specifying such a set of assumptions is provided by Kleven, Kreiner and Saez (2007). Brewer et al. (2008) cite the results of this model in support of their view that:

"*… the broad way in which tax and benefit systems of many OECD countries treat the income of couples, including the UK, are consistent with optimal tax results*."

Section 3.3 discusses the Kleven et al. model at some length as an example of the way in which an optimal tax model can be formulated to yield results that support a preferred ideology.

A note on FTB Part B

From the example in Table 2.7 we can see how an income test on a universal family payment can have the effect of moving from progressive individual income taxation to a system based on joint income with the highest MTRs across the middle of the distribution of joint incomes. However, if there is a zero rated threshold in the pre-reform individual income tax, the second earner can still face a lower MTR across that threshold, as illustrated in the example above where the second earner faces a MTR of 25 cents in the dollar in quintile 1 instead of 32 cents as in quintile 2.

Any gain from a zero rated threshold in the pre-reform individual system can be eliminated by introducing a "dependent" spouse rebate or, alternatively, a payment in the form of FTB-B. Suppose that in addition to withdrawing the transfer of $20,000 at a rate of 25 cents in the dollar on joint income above $20,000, the government provides a transfer of $1,400 which is withdrawn at a rate of 7 cents in the dollar on

[14] For further discussion and analysis, see Apps and Rees (1999a,b).

the income of the second earner from zero dollars of income. This will have the effect of raising the MTR on the second income in quintile 1 to 32 cents in total. The result is that the new tax system is completely equivalent to a joint income tax where tax revenue is used to fund a universal transfer of $20,000 and raised by a rate scale on joint income as follows: a zero rate up to $20,000, 32 cents in the dollar on incomes from $20,001 to $100,000, and 14 cents in the dollar on incomes above $100,000.

Where has all the money gone?

The preceding analysis gives an indication of the large tax revenue "savings" that can follow switching from universal to joint income-tested family payments. It is of interest to note that this type of policy was introduced at the end of a period, from around 1960 to the early 1980's, which saw a major increase in female labour supply.[15] Thus, joint income-testing of family payments was introduced at a point in history when the tax base, and therefore tax revenue, should have reached a higher level than in any earlier period, especially given the degree of accumulated bracket creep at the time. Moreover, since around 1980, successive governments have failed to fund adequately education, health and infrastructure. These observations raise the question: "Where has all the money gone?" One possible answer is the failure to address the loss of tax revenues from opportunities for tax avoidance, for example, through the use of trusts and negative gearing arrangements, recognised in the early 1980's as key problems with the then-existing income tax system. This failure can also be seen as an implicit way of further reducing tax rates on top income earners.

3 The importance of empirically relevant models

The question we now consider is whether the direction of reform described by the example in the preceding section can be supported on the basis of any set of plausible assumptions. Our introductory comments imply that it cannot. In this section we present data on female labour supply and the allocation of time to child care (Section 3.1) and on earnings distributions (Section 3.2) to support this view. Section 3.3

[15] There was also a decline in male labour supply but this in no way matched the increase in female labour supply.

provides a brief overview of developments in optimal tax theory that are relevant to the taxation of families. The survey includes a discussion of the Kleven el al. (2007) model as an illustration of the extent to which it is necessary to specify entirely arbitrary and counterfactual assumptions to justify joint income-tested family payments, and therefore the general direction of tax reform over the past two and half decades that has occurred not only in Australia but also in the UK and US.

3.1 Female labour supply and time allocation to child care

According to the data for couples in the Household, Income and Labour Dynamics in Australia Survey, Wave 5, 2005 (HILDA 2005), 92 per cent of males and 73 per cent of females of prime working age, defined as 25 to 59 years, are employed - a difference of less than 20 percentage points. However, almost all prime aged married males - 85 per cent - work full time while only 34 per cent of prime aged married females are in full time work. The result is that married women work around half the hours of married men in this prime age category. These figures also reveal a high degree of heterogeneity in female hours. While male labour supply shows relatively little variation, with almost all men working full time, females are distributed more evenly between zero hours and full time work. This is illustrated in Figure 3.1. The figure presents histograms of male and female hours of market work based on HILDA 2005 data for "usual weekly hours of work" of partners aged from 25 to 59 years. The first band of the histogram represents 0 to 4 hours and subsequent bands, increments of 10 hours.

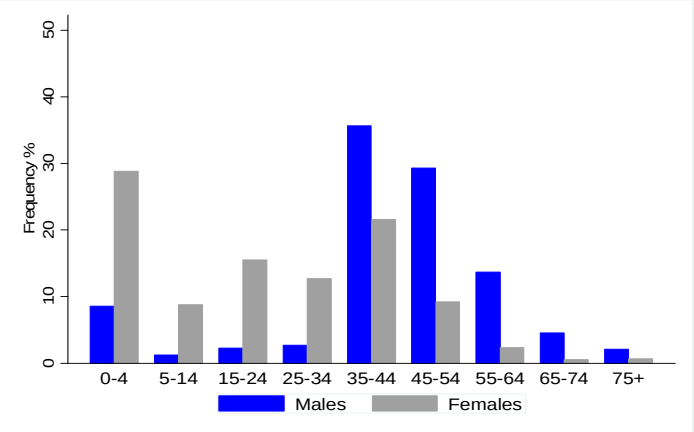

Figure 3.1 Household labour supplies: prime aged couples

Empirical work on labour supply typically finds that heterogeneity in female hours is strongly associated with the presence of children in the household, as we would expect. However what is important is that significant heterogeneity emerges only with the arrival of the first child. To see this, it is useful to compare the labour supplies of couples across four broad life cycle phases: a pre-child phase;[16] a 0-4 child (or pre-school) phase in which the youngest child is under 5 years, a 5-17 child phase in which the youngest child is at least 5 years but under 18, and a post-child phase in which there are no longer children under 18 years present. Figure 3.2 presents histograms of male and female hours of market work in these phases.[17]

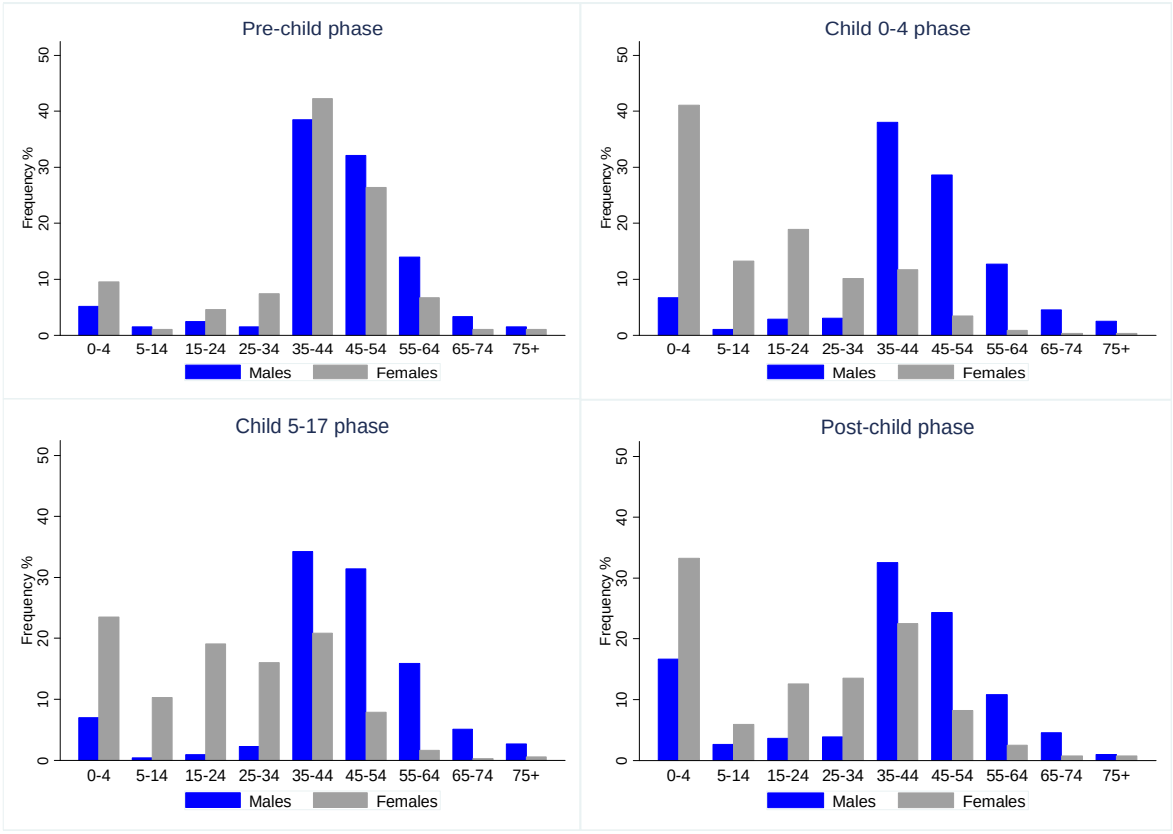

Figure 3.2 Household labour supplies: life cycle phases – prime aged couples

[16] This phase includes all records in which there are no children present in the household and the female partner is under 42 years.
[17] For further detail on the partitioning of the sample into these phases, see Apps and Rees (2009).

In the first phase, the profiles closely match - partners of prime working age tend to work full time and for the same hours.[18] In the 0-4 child phase, the proportion of men working full time remains about the same, while that of women falls dramatically. At the same time a high degree of heterogeneity in female labour supply, which cannot be explained adequately by wage rates or non-labour incomes, emerges, with 60 per cent remaining in work but less than 20 per cent in full-time work. In the 5-17 child phase, full time female employment rises to 31 per cent. Around 24 per cent continue to work less than 5 hours per week. In the post-child phase, the proportion of females reporting working less than 5 hours per week rises to a third, and around a third work full time. Thus, in the post-child phase female labour supply remains well below its pre-child level, indicating a high degree of "persistence" in the labour supply decision made in the pre-school phase.[19]

From this life cycle organisation of the data it is clear that variation in female labour supply cannot be attributed simply to demographic variables. More plausibly, it can be argued that the observed changes in female labour supply are driven by the economics of investment in the care and education of children, much of which is directly influenced by government policy, and by the gender wage gap.

The argument is straightforward. In phase 1 there is a low demand for home-produced goods and services because there are few of the kinds of goods and services couples in this phase consume for which there are not good, affordable market substitutes, and so there is a low demand for domestic labour in this phase. Put simply, there's nothing much to do in the home, and so it would make no sense for either partner to specialise in household production, or for singles who have not yet had children to do so. Moreover, the gender wage gap is likely to be less significant in this early phase. These conditions explain why almost all males and all females who have not yet had children, whether single or married, work full time and have close to the same average weekly hours.

[18] There are fewer records in this phase that in later phases. However, when we include singles who have not yet had children, and who are essentially in the same life cycle phase, we obtain similar results for a much larger sample. Almost all men and all women not in higher education work full time prior to having children.

The arrival of children creates a very large demand for their care and for investment in their education. While government has taken over much of the role of investing in the education of children once they reach school age, it has largely neglected to invest in the care and education of those under school age, especially in the sector's required infrastructure.[20] The result is that market child care can be very costly, due primarily to the long term failure of government to invest in the sector's infrastructure in line with that of other education sectors, in an imperfect capital market.[21] At the same time, the income of the second earner is subject to a high average tax rate, as shown in the section to follow. These policies undermine the capacity of a second earner to finance child care, especially when her future wage is uncertain and she faces an imperfect capital market in which the borrowing rate is above the lending rate.

Child care can be provided by some combination of parental time and services bought in from the market. The opportunity cost of parental child care is determined by the present value of the current and future net market income foregone. The higher the effective tax rate on the second earner and the more costly and difficult it is to access market child care, the more of it will be provided at home, other things being equal. The demand for child care then implies a large induced demand for household production and introduces a fundamental change in the work choices of couples, which will reflect the relative costs of each partner's time. Moreover, withdrawal from the labour market by the female as the lower wage partner in phase 2 can lead to a lower wage due to loss of human capital and career possibilities.[22] Under these conditions it is not surprising to find a large gender gap in market hours and a high degree of heterogeneity in female hours.

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[19] This is consistent with the results of panel data studies for the US. See Shaw (1989, 1994).

[20] To see that the high cost of child care is due to the long term failure of government to invest in the infrastructure of the sector, one need only consider what would happen if the government decided to sell off all its accumulated assets in the primary school sector and allow the sector to be privately owned and run for profit. Many parents would be unable to afford the cost. Female labour supply would fall as well as school attendance. Fee subsidies and tax relief do not provide a long term solution to the problem.

[21] In a perfect capital market, children would be able to borrow to pay for their consumption and investment in their human capital, and they would repay the debt during their working years. Clearly, there are numerous reasons for why capital markets fail in this context. For further discussion, see Apps and Rees (2001, 2003).

Time use data support the foregoing argument by providing strong evidence of the substitution of household production, consisting mostly of child care, for female market work after the first child. Table 3.1 reports data means for average weekly hours allocated to these activities by couples in each of the four life cycle phases. The time input to household production in phases 1 and 4 is computed as time spent on domestic work (washing, cooking, cleaning, etc.) and shopping. In phases 2 and 3, the time input to household production is split into domestic work and child care.[23]

Table 3.1 Market, domestic and child care hours per week

		Female	Male
Phase 1	Market hours	37.7	43.1
	Domestic hours	14.2	11.2
Phase 2	Market hours	16.9	43.2
	Domestic hours	26.2	14.0
	Child care hours	35.7	13.9
Phase 3	Market hours	21.0	43.2
	Domestic hours	24.0	11.8
	Child care hours	20.2	9.9
Phase 4	Market hours	22.1	36.7
	Domestic hours	28.5	15.5

In phase 1 both partners work similar full time hours and allocate relatively little time to domestic work. Phase 2 is very different. Female market hours drop to less than 50 per cent of their phase 1 level and there is a large increase in time spent on household production, well over half of which is child care.

In phase 3 female labour supply rises by four hours while domestic hours change very little. Males also spend more time on household production in phases 2 and 3 but the increase is almost entirely on child care. Unlike married females, who substitute away from both market work and leisure, married males tend to substitute away from

[22] This effect offers an explanation for the persistence of female labour supply decisions made in the preschool phase. An extensive literature on work related human capital accumulation includes the contributions of Altug and Miller (1998) and, more recently, Imai and Keane (2004), among others.
[23] Market hours are computed from the data on "usual weekly hours of work" in HILDA. Time use data on domestic and child care hours in the ABS 2006 Time Use Survey (AU TUS) are merged with the HILDA sample using regression models with the dependent variable of the domestic hours equation specified as the ratio of domestic hours to leisure hours, and of child care hours, as the ratio of child care hours to domestic hours.

leisure only. In the post-child phase, the increase in female market hours tends to be marginal, and hours of domestic work remain significantly higher than in phase 1.[24]

When we disaggregate by employment status, we find that female market hours are strongly inversely related to hours of home production, and especially child care in the child rearing phases. Table 3.2 reports data means for phases 2 and 3 by employment status. Mothers who are employed full time work an average of 42.7 hours per week in the market and spend 22.3 hours on domestic work and 16.1 hours on child care. For those who work entirely at home, time spent on domestic work rises to 36.5 hours, and on child care, to 32.0 hours. The table also reports the percentage of families with a child aged 0-4 years and the average number of children under 18 years, in each employment status category. While age and number of children have a significant impact on female labour supply, there are clearly many families with identical demographic characteristics making very different time use choices.[25]

Table 3.2 Phases 2 and 3: Female time use by employment status

	Domestic hours pw	Child care hours pw	Market hours pw	% of child 0-4	# of children	% of records
Full time	22.3	16.1	42.7	29.4	1.88	34.3
Part time	27.9	23.0	18.9	43.3	2.06	38.6
Not employed	36.5	32.0	0	56.5	2.31	27.1

These data have implications for the modelling approach needed for estimation of the parameters of behavioural responses to policy changes. Most importantly, it makes no sense to specify a model that ignores home child care as a substitute for female labour supply and bought-in child care, especially in an economy with a poorly developed child care sector. The data indicate that it is this substitution that drives high estimates of female wage elasticities. In fact, organising the data across the life cycle defined on the age of the youngest child, as in Figure 3.2 and the tables above, yields profiles that suggest that female participation and labour supply elasticities

[24] A possible explanation for the high level of domestic hours is that it is an effect of a loss of market human capital on the female wage. As the wage of the partner specialising in household production falls over time, the opportunity cost or implicit prices of domestic goods and services fall relative to those of their market substitutes.

[25] As we will see in the section to follow, gross hourly earnings would also appear to explain relatively little of the observed heterogeneity in female labour supply.

could be well above those of many studies in the literature.[26] On the other hand, studies reporting prime age male elasticises that are close to zero appear to be supported by the data.

The preceding data analysis also serves to highlight the fact that a two-earner household with a pre-school child and both partners in full time work must buy in child care and related services. In contrast, a household in which one partner specialises in home production pays for child care through the opportunity cost of her time, and that partner's time input to home production is remunerated implicitly through intra-household exchange of her output for her consumption of market goods funded by the earnings of her spouse. Ideally the household should be modelled as a small economy engaged in production and intra-household exchange, with heterogeneity reflecting varying degrees of production and exchange across households. From this view of the household it is self evident that the across-household welfare distribution will depend on household production in addition to market income.

Neither an income tax, nor a consumption tax, can be applied to a tax base that includes household production, and so households with the same wage rates and demographic characteristics will pay different amounts of tax, depending on the second earner's choices between market vs. domestic work. Those who substitute household production for market work avoid paying tax on the implicit income derived from domestic labour, and they avoid consumption taxes on the output. In respect of the latter, it is important recognise that a shift from income towards consumption taxation does not represent a solution to the problem of taxing couples. Unfortunately the literature on indirect taxation can often give misleading advice due to ignoring the policy implications of the untaxed status of household production and heterogeneity in female labour supply.

As already shown in Section 2, under a progressive individual income tax, a two-earner household can pay twice as much tax as the single-earner household working

[26] A major limitation of the literature on female labour supply elasticities is that the conventional model treats home child care as leisure, priced at the net wage. Data on the true prices across

only half the market hours, and with the second partner working full time at home. Under a joint income tax the two-earner household pays more than twice as much tax. The high taxation of married mothers as second earner under joint taxation cannot be justified other than under highly specialised assumptions, for example, about her home productivity or the price of bought-in child care. We now investigate the extent to which household income can give misleading information on household living standards.

3.2 Household income: an unreliable indicator of household welfare

If families with the same wage rates and demographic characteristics were observed to make the same time allocation decisions, then, all else being equal, we could reasonably expect to find a strong correlation between household income and family welfare within a demographic group. Under these conditions, a progressive tax on household income would not necessarily be unfair in terms of its distribution of burdens across households. It would, of course, widen the net-of-tax gender wage gap and could therefore be expected to disadvantage women in general by widening inequality within the family. However, it would not discriminate on the basis of employment status because, at given wage rates, all would be the same type.

However, with heterogeneity in female labour supply across households with the same wage rates and demographic characteristics, this is no longer the case. Furthermore, the problem of errors in a welfare ranking defined on household incomes becomes especially serious when, as the analysis to follow will show, the profile of male earnings, and therefore also of primary earnings, for full time work is relatively flat across the middle of the distribution and then rises sharply towards the top.

The analysis is based on data for a sample of 1608 “in-work” couple income units with a dependent child drawn from the Australian Bureau of Statistics (ABS) 2005-06 Survey of Income and Housing (SIH06). The sample is selected on the criterion that

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households are missing.

at least one parent is employed.[27] Families with negative incomes from investments or unincorporated enterprises, or a primary income below $15,000 per annum are also excluded. The partner with the higher private income is treated as the primary earner.[28] The male partner is the primary earner in over 88 per cent of records. All incomes are indexed to the 2008-09 financial year.

The sample is split into three household types defined on employment status:

SE: Single-earner household
PT: Two-earner household with second earner employed part time
FT: Two-earner household with second earner employed full time. [29]

Table 3.3 reports the distribution of types by primary income and Table 3.4, the distribution of market hours of work. Since the male is the primary earner in the vast majority of cases, the quintile profiles highlight gender differences in labour supply and the high degree of heterogeneity in the labour supply of married mothers, at every level of primary income. Those employed full time work almost the same hours as married men and those employed part time, less than half male hours.

Table 3.3 Household type by primary income, 2008-09

Quintile	**1**	**2**	**3**	**4**	**5**	**All**
Primary income $pa	34815	50197	63105	79902	150620	76233
SE %	40.1	31.3	26.7	28.3	40.5	32.9
PT %	37.9	37.4	44.2	40.4	35.6	39.0
FT %	22.0	31.3	32.1	31.4	24.0	28.0

Table 3.4 Labour supplies by primary income, 2008-09

Quintile – primary income	**1**	**2**	**3**	**4**	**5**	**All**
SE						
Primary market hours pa	2070	2264	2337	2470	2522	2325
PT						
Primary market hours pa	2173	2302	2292	2425	2523	2340
Second market hours pa	1055	1076	1078	1036	1068	1062
FT						
Primary market hours pa	2093	2191	2213	2316	2453	2253
Second market hours pa	2206	2201	2229	2198	2314	2227

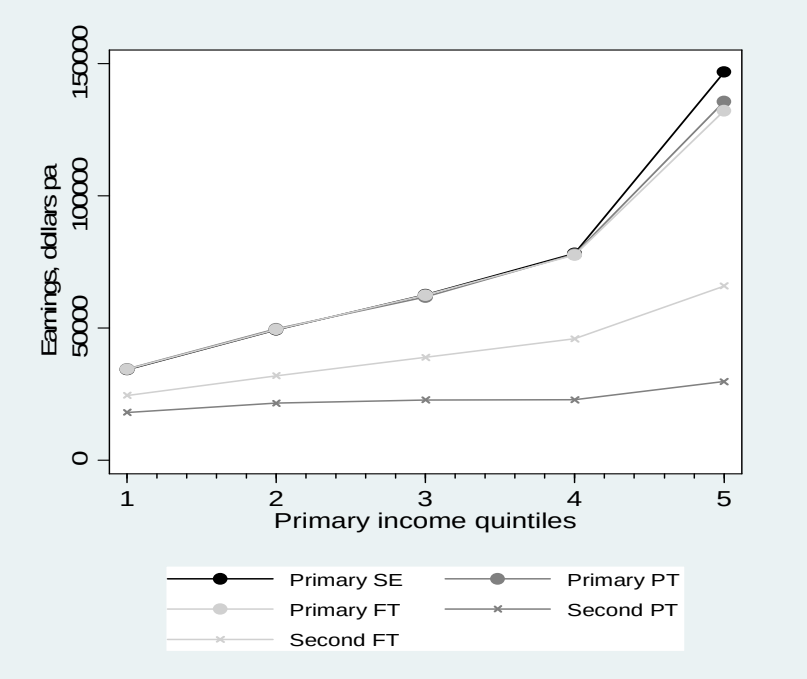
[27] Note that this criterion excludes very few records. Less than half of one per cent of families of prime working age reports both parents as unemployed.
[28] Private income is income from all non-government sources such as wages and salaries, profits, investment income and superannuation.
[29] "Full time" is defined as employed 35 hours per week or more.

Table 3.5 presents data means for primary and second earnings by quintiles of primary income. Figure 3.3 presents the results graphically. A crucial feature of the earnings profiles is the relatively flat segment across the middle quintiles. This means that the position of a family in a ranking defined on household income will be very sensitive to the earnings, and therefore to the labour supply, of the second earner because it will take only a small increase in her earnings to shift a family from a low percentile of family income to a significantly higher point in the distribution.

Table 3.5 Primary and second earnings by primary income, 2008-09 $pa

Quintile – primary income	1	2	3	4	5	All
SE						
1. Primary earnings $pa	34199	49290	62678	78185	146866	76854
PT						
2. Primary earnings $pa	34540	49652	61729	77974	135801	71194
3. Second earnings $pa	18090	21546	22781	22826	29727	22911
FT						
4. Primary earnings $pa	34298	49457	62430	77624	132322	70634
5. Second earnings $pa	24532	31969	38914	45919	65941	41342

Figure 3.3 Primary and second earnings by primary income, 2008-09 $pa



This is illustrated in Table 3.6. The table gives the quintile distributions of the three household types by *household* income. In contrast to the ranking by primary income, the majority of single-earner families are in the lower quintiles because household income omits the family's implicit income from household production.

The upper limit of quintile 1 is $55,956 and the lower limit of quintile 4 is $96,369. A single-earner family with an income of, say, $50,000 will be located in quintile 1. If the family switches "type", with the second partner working full time for the same income, it will be re-ranked from quintile 1 to quintile 4. If the household has a preschool child, much of the second net income may be spent on child care. Clearly, such a household cannot be said to have the same standard of living as another in which only one parent needs to work full time to earn $100,000 while the other works full time at home. To argue to the contrary it is necessary to assume that home child care makes little to no contribution to family welfare or that market child care is costless.

Table 3.6 Household type by household income, 2008-09

Quintile	**1**	**2**	**3**	**4**	**5**	**All**
Household income $pa	42897	67219	86397	108410	196060	100632
SE %	60.3	35.9	22.7	25.2	20.8	32.9
PT %	27.0	40.1	42.1	41.8	36.2	39.0
FT %	12.7	17.1	34.9	42.9	41.8	28.0

To summarise: The fundamental deficiency of the household income ranking is that it is defined on an income variable that omits the family's implicit income from home production. The ranking is driven by the labour supply of the second earner, and is therefore negatively correlated with time allocated to domestic work and child care. Basing taxes or the withdrawal of benefits on household income will therefore inevitably discriminate against working married mothers.

3.3 Optimal tax theory: do the models fit the data?

While contributions to the theory of optimal taxation have provided important insights into the structure of the tax design problem, as noted in section 2, the literature has nevertheless been slow to develop models that are consistent with the data on two-parent families in an economy in which female labour supply and the allocation of time to home child care are significant and heterogeneous.

Much of the literature, and certainly that part of it which is taught in standard textbooks at the undergraduate and graduate levels, is based on the model of a

household as a single individual who divides time between market work and leisure – the direct consumption of one's own time – to earn an income that is then spent on market goods. Household production is missing. The models also assume that market wage rates reflect innate abilities, thereby implying, for example, that the gender wage gap reflects a gap in innate ability. The models in Apps (1981, 82) provide an early critique of these assumptions, presenting instead an analysis in which women are "crowded" into household production by labour market discrimination. The household is modelled as a small economy engaged in production and intra-household exchange, where the terms of exchange are set by the "outside" female wage. In this kind of model a joint tax system reduces the outside net wage of the female partner and, in turn, makes the terms of intra-household exchange less favourable for her.

One of the most widely cited contributions that extends the analysis to a two-person household is the linear tax model of Boskin and Sheshinski (1983). The authors derive the result that, for optimally, women should be taxed at a lower rate than men. This builds on the observation, dating back to Munnell (1980) and Rosen (1977), that since women have higher compensated labour supply elasticities, standard Ramsey arguments would imply, other things equal, lower tax rates.

Drawing on Ramsey principles does not however provide a conclusive argument. The optimal tax rate in a linear tax model depends not only on the efficiency effects of taxation, but also on distributional effects, and it is *a priori* possible that the tax rate on women could optimally be higher, despite the higher elasticities, if this tax rate were a sufficiently better instrument for redistribution than that of men. This depends on the across-household covariance between the marginal social utility of income and gross income of, respectively, men and women. Boskin and Sheshinski use a model calibrated with parameter values that are representative of empirical estimates to derive the result that, when distributional effects are taken into account, the optimal tax rate on women is indeed below that on men. But this is just an example. There has been little further empirical work done to test its robustness.

More recently, Apps and Rees (1999a, 2007) show that, both in the tax reform and optimal linear tax cases, the Boskin and Sheshinski result, hailed as the "conventional

wisdom" in this area, can be put on a firmer foundation.[30] Given that the ratio of female to male income falls as we move through the income distribution, as indicated in Table 3.5 and Figure 3.3, and that the correlation between male and female wage rates across households is sufficiently strong (positive assortative matching), also evident from the data, the male tax rate is always a better instrument for income redistribution from higher wage to lower wage households, and this then reinforces the effect of higher labour supply elasticities in supporting a lower tax rate on women.

It is almost a trivial result that male and female tax rates should differ. Equalising their marginal tax rates, as is done in a joint taxation or income splitting system such as those in the US and Germany, amounts to imposing a constraint on the optimal tax problem which cannot increase, and in general will reduce, the optimised value of social welfare. Less trivial is the argument that women should be taxed at lower rates than men with the same gross income. It is often objected that "gender-based taxation"[31] does not exist and could not be introduced. This is not true. Australia has gender based taxation in the form of FTB-B. The problem is, however, that the discrimination goes in the wrong direction – FBT-B raises the tax on the second earner, typically the female partner, instead of lowering it.

More powerful however is the argument that although labour supply elasticities are on average higher for women, this is because of the greater proportion of women who earn lower wages and also because of the higher degree of non-participation among women. Heckman (1993) argues that as the female wage distribution and distribution of working hours becomes more like that of men (assuming of course that there are changes in tax and child care policies that allow it to do so), their labour supply elasticities will converge toward those of men.

An answer to both these arguments is a tax system that is not gender-based but rather based on progressive individual taxation, where primary and secondary earners are taxed individually but on the same progressive rate schedules. This would necessarily imply that tax rates on second earners would be below those on primary earners when

[30] See also Feldstein and Feenberg (1996).
[31] A term introduced by Alesina et al. (2007).

their incomes are sufficiently lower as to place them in a lower tax bracket. It would also mean that ATRs would be positively related to the gap in partners' earnings – a single-earner family would face a higher ATR on household income than a two-earner family with the same joint income. The difference would at least partly compensate for the higher level of untaxed home production in the single-earner family. Progressive individual taxation therefore has the potential to achieve a higher degree of horizontal equity as well as a higher degree of vertical equity, for a given efficiency cost.

In the case of non-linear taxation in the tradition of Mirrlees (1971), the papers by Apps and Rees (2006), Brett (2007), Cremer et al (2007), Kleven et al (2009) and Schroyen (2003) consider the problem of extending the Mirrlees analysis to the case of two-earner households. General results are hard to find, essentially because of the complexity of the two-dimensional screening problem that arises when the productivity of each household member is the household's private information. Even in the relatively simple case of two wage types for primary and secondary earners, which is the approach adopted by Apps and Rees, Brett, and Schroyen, the multiplicity of potentially binding incentive compatibility constraints gives rise to a wide range of possible solutions. The main general result of these analyses is that the tax rates on men and women will vary with their productivity type, and so individual taxation is still in general optimal, but the tax rate on a given individual of one of the two types will also depend on the type of his or her partner. In this sense, the tax unit consists of both the individual and the couple.[32]

The approach adopted by Kleven et al. in simplifying the model to make the optimal tax problem analytically more tractable, is very different. It is worth discussing this model at some length because it is cited authoritatively as providing support for income-tested benefits in IFS papers for the Mirrlees Review on reforming the UK tax system. The assumptions of the model are, however, inconsistent with the data.

[32] This suggests that the question that has often been posed in the literature: "should the individual or the couple be the appropriate tax unit" is wrongly formulated, or at least only makes sense in the context of linear taxation.

The authors assume a continuum of household types, as in the Mirrlees model, where the primary earner has a given innate productivity level measured by the market wage. Associated with each primary earner wage type is a continuum of second earner types. In the first formulation of the model, these differ in the fixed cost they face of going out to work, so that this is the second dimension, in addition to the primary earner wage type, along which households are to be screened. In the second formulation, the second earners differ in their innate productivities in household work. Since the former model is the one cited in the discussion of policy by Brewer et al. (2008),[33] we focus here on this formulation of the problem.

Key assumptions underlying this model are:

- All second earners face the same market wage rate, i.e. there is no variation in their innate productivity, they are all of the same "wage type".
- While primary earners choose a level of labour supply on a continuum between zero and full employment, second earners are restricted to choosing either to work full time or not at all. There are no part time jobs for second earners.
- The characteristics of primary and secondary earners are independently distributed, there is no correlation of types across households, so that for example households with higher primary earner wages do not tend to have lower (or higher) fixed costs of working or higher household productivity for the second earner.

Each of these assumptions is counterfactual, as the data presented earlier show. There is variation in the market wage of working women, women choose market labour supplies right across the distribution from zero to full time, and there is significant positive correlation across couples between male and female wage rates. Indeed it is men who tend to work either full time or not at all.[34] It is of course always necessary to make simplifying assumptions for modelling purposes. The resulting model ought however to bear some resemblance to the real economy for which it is purporting to prescribe an optimal tax system.

[33] In the discussion paper version, Kleven et al (2007), the only sources of possible female labour supply heterogeneity are differences in the fixed cost of working. In the published version they also consider the case in which the latter are replaced by differences in productivity in household production. They show that the results of their analysis are reversed if second earners are the ones with lower household productivity. Thus the authors seem to be late converts to the position advocated by Apps and Rees since Apps (1981), (1982).

The first two of the above assumptions yield the simplification of the model which allows a standard Mirrlees-type optimal tax analysis to be carried out. They imply that there are in effect only two types of second earner, those that choose to work and those that do not. Moreover, this choice is based on a simple calculation. If they work, all second earners have the same income, since they all work full time at the same wage. Therefore they will choose to work if and only if this income exceeds their fixed cost of going out to work, which has a given distribution conditional on the primary earner's wage. For each value of the latter, there will be a critical level of the cost of work, above which second earners choose not to work, and below which they work. This implies immediately that, given the primary earner's wage, all households in which the second earner works are better off than those in which she does not, and so a planner who wants to redistribute from better- to worse-off households will want to transfer income from two-earner to single-earner households. By its construction therefore, the model rules out the possibility that household income is not a reliable indicator of a household's well-being.

Obviously, the welfare of households will also depend on the primary earner's wage, but this can be dealt with as a standard Mirrlees-type optimal tax problem, since this is a one-dimensional source of variation in household welfare. Thus the problem becomes one of choosing just two Mirrlees-type tax functions, one for households where the second earner works, one for those in which she does not. The double continuum of household types, which is what presents the problem of applying the Mirrlees approach, is replaced by two single continua, and this is straightforward to handle mathematically.

A further implication of the model construction is that second earners, given that they choose to work, have a zero labour supply elasticity at the intensive margin, i.e. in terms of choice of number of hours worked. The only source of behavioural response is the participation decision, which is determined by the tax rate on secondary earners.

[34] The paper in fact defines individuals as primary and second earners rather than by gender, but of course the overwhelming majority of primary earners are male and second earners female even in the US economy.

Primary earners, on the other hand, have the standard elasticity responses, both in terms of hours and participation.

It is not surprising that, since the policy maker seeks to redistribute income from two-earner to single-earner households, the optimal marginal tax rate on a primary earner in the former is found to be always higher than in the latter. The implicit tax[35] on the income of the secondary earner, arising out of the higher tax on the primary earner in a two-earner household, is just high enough to make the marginal second earner, at each primary earner type, indifferent between working and not working.

The second main result of the analysis is what the paper calls "negative jointness": the implicit tax rate on the second earner and the difference in marginal rates between primary earners in two-earner and single-earner households both fall as the wage of the primary earner rises through the primary earner wage distribution. The intuition for this is straightforward: the tax structure is rationalised by the desire to redistribute from two-earner to single-earner households, but, the higher the primary earner income, the lower is the second earner's (constant) income as a proportion of the household's total income. This means that the difference in marginal social utilities of income between the two household types falls as we move through the primary earner wage distribution, and so the desire to redistribute from two-earner to single-earner couples also falls. This gives the "negative jointness" result.[36]

In an attempt to emphasise the plausibility of this result, the paper points out that [37]

"*most OECD countries, including those which have moved to individual tax filing, also operate family-based means-tested welfare programs with transfers being phased out with joint family income". The combination of an individual income tax and a joint welfare system creates negative jointness.*"

[35] There is no explicit tax on the second earner's income, the tax function is defined only on the primary earner's income, for each of the two household types. This makes the comparison with actual tax systems a little problematic, something which is glossed over in the empirical part of the paper, as well as in Brewer et al.

[36] However, although the intuition is clear, in fact further substantive assumptions are required to derive this result, among which are that the marginal social utility of income is a convex function of income, and that primary earner income and the fixed cost of work to the second earner are statistically independent.

[37] That is, the discussion paper version, Kleven et al. (2007).

Under such a system, a woman married to a husband with a low income faces a higher marginal tax rate than a woman married to a husband with a high income. The paper then derives this result as a feature of an optimal tax system.

However, the remoteness from reality of the model on which this analysis is based makes it hard to accept the "negative jointness" result as a justification for any kind of real-world tax system, though it may suggest the lengths to which it is necessary to go to find such a justification. For example, the paper gives no guidance on the structure of the tax system when there is *both* variation across households in household productivity *and* varying costs of going out to work,[38] and it is also unclear how variation in second earner market wages, together with strong positive correlation with primary earner wages, would affect the conclusions. Yet these are all important aspects of the real economy.

It is also important to point out that actual tax systems are not Mirrlees-optimal systems, and so it cannot be supposed that there is in fact the degree of redistribution between high- and low-income households that is a characteristic of an optimal Mirrlees tax system. We provide evidence below to show that second earners in lower- and middle-income households face much higher average tax burdens than high income single-earner households, which is unlikely to be a result of a Mirrlees-optimal tax system.

4 Australian income tax and family tax benefit system

We now turn to the structure of marginal and average rates under the Australian income tax system in the 2008-09 financial year resulting from four key tax policy instruments:[39]

- Personal Income Tax (PIT);
- Low Income Tax Offset (LITO);
- Medicare Levy (ML); and
- Family Tax Benefit Part A (FTB-A) and Family Tax Benefit Part B (FTB-B).

[38] Where a major part of the cost of going out to work is that of replacing the household production and child care foregone.

[39] Child Care Benefit is not included. This is unlikely to alter significantly the overall results, given that available unit record data on government direct and indirect benefits for child care indicate that they tend to be distributed independently of employment status.

Section 4.1 begins with the PIT and LITO and sections 4.2 and 4.3 introduce the ML and FTB system. Identifying the combined effect of the PIT and LITO on tax rates is straightforward because the tax base remains individual incomes. The ML, FTB-A and FTB-B are more complex because they involve joint taxation. The tax rates on partners' incomes are therefore interdependent. The rates also depend on the ages and number of children. We therefore present results for a selected case. Section 4.4 reports the findings of an empirical analysis of the impact of the system on families using the ABS SIH06 sample of 1608 "in-work" families described in Section 3.2.

4.1 Personal Income tax and Low Income Tax Offset

The LHS of Table 4.1 lists the *formal* MTR scale of the PIT. The RHS lists the true rate scale when the LITO is included. The LITO in the current tax year is $1,200 and is withdrawn at a rate of 4 cents in the dollar above a lower income threshold of $30,000. It is therefore fully withdrawn at an income of $60,000. Figure 4.1a depicts graphically the effect of the LITO on the MTR scale of the PIT as annual taxable income rises. Figure 4.1b plots the resulting profile of ATRs with respect to income.

According to the specified *formal* rate scale we have a strictly progressive, piecewise-linear income tax. However, when the LITO is included, this is no longer the case. A higher rate in the dollar applies to incomes from $34,001 to $60,000 than to the next income band, $60,001 - $80,000. The LITO raises the zero rated threshold from $6,000 to $14,000 and it also raises MTRs on incomes above $30,000 by 4 cents in the dollar until it is fully withdrawn. This results in a MTR of 34 cents in the dollar on incomes from $34,001 to $60,000, followed by a lower rate of 30 cents in the dollar up to $80,000, as shown in Table 4.1. The LITO is in fact an entirely redundant policy instrument that serves only to reduce the transparency of the higher rate of 34 cents in the dollar in the middle of the scale.

The usual argument for the LITO is that of "cost" saving. Its proponents claim that an offset is a less costly use of taxpayers' money for assisting those on very low incomes than an increase in the zero rated threshold, which provides a benefit to all taxpayers

above the threshold. The inconsistency in the argument should have been apparent from the outset because each increase in the LITO has been combined with tax cuts at high income levels over successive budgets. Moreover the *true* rate scale is easy to identify because, unlike FTBs, the individual basis of the PIT is preserved.

Table 4.1 Tax rates on personal income, 2008-09

Reported rate scale		True rate scale	
Taxable income	**MTR**	**Taxable income**	**MTR + LITO($1200)**
$0 - $6,000	0.00	0-14,000	0.00
$6,001 - $34,000	0.15	$14,001 - $30,000	0.15
$34,001 - $80,000	0.30	$30,001 - $34,000	0.19
$80,001 - $180,000	0.40	$34,001 - $60,000	0.34
$180,000 +	0.45	$60,001 - $80,000	0.30
		$80,001 - $180,000	0.40
		$180,000 +	0.45

Figure 4.1a MTRs: PIT scale and LITO, 2008-09

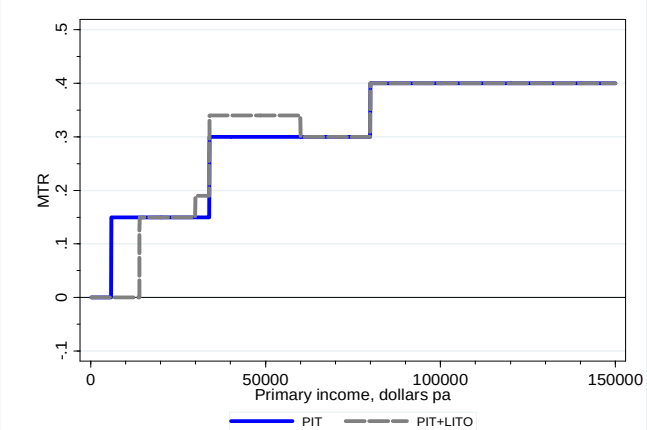
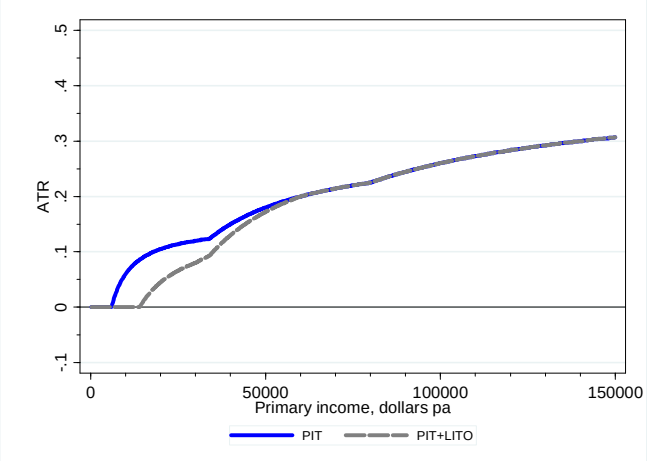
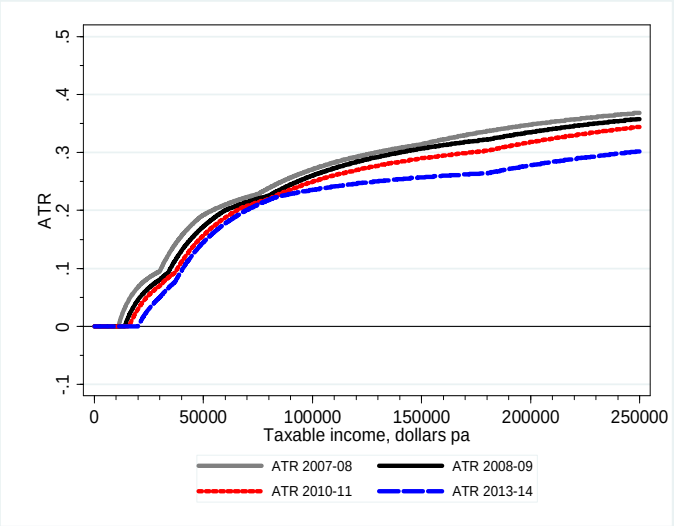


Figure 4.1b ATRs: PIT scale and LITO, 2008-09



When we compare successive increases in the LITO and the simultaneous cuts in rates on higher incomes introduced in recent budgets and proposed for future years, the role of the LITO in shifting a disproportionate share of the tax burden towards middle income earners becomes evident. Figure 4.2 plots the ATR profiles of the PIT scale and LITO for 2007-08, 2008-09, the proposed rate scale and LITO for 2010-11, and the Government's "aspirational" rate scale and LITO for 2013-14. The MTRs for the additional years are listed in Appendix B, Table B1.

Figure 4.2 ATRs: PIT+LITO, 2007-08, 2008-09, 2010-11 and 2013-14



The figure indicates graphically the extent to which the LITO and tax cuts at higher income levels deny individuals on average earnings an equi-proportional rate of compensation for the failure to index tax bands. There is a far smaller vertical gap between the ATR profiles for each year across taxable incomes from around $55,000 to $85,000 pa.

The changes in tax burdens in each year are relatively small, but always in the same direction in terms of the redistribution of the overall tax burden. Consider, for example, the changes from 2007-08 to 2008-09. The tax cuts provided by shifts in income thresholds gave the largest gain, of $2600, to individuals with incomes at or above $180,000. This gain reduced the ATR on $180,000 by 1.44 percentage points. From $60,000 to $75,000 the gain is only $600, due entirely to the $4000 rise in the lower threshold for the 30 cents in the dollar rate. This gives only a 1.0 percentage point reduction in the ATR at $60,000 and a 0.8 percentage point reduction at $75,000. At $30,000 the increase in the LITO provides a gain of $450, which reduces

the ATR by 1.5 percentage points. At $34,000 the gain is $1050 ($600 + $450). At this income level the gain is a 3.1 percentage point reduction in the ATR, which thereafter declines to less than 1 percentage point from $60,001 to $75,000. Thus the lowest percentage point gains apply across the "middle".

In discussing the PIT scale and LITO, the Australian Treasury (2009, p81) notes:

"*Australia has a progressive personal income tax system. The personal rate scale has four personal income tax rates, as well as a zero rate of tax below the tax free threshold. In addition, other elements such as the low income tax offset (LITO) alter the effective rate of taxation. A progressive income tax could be achieved with a tax-free threshold and a single rate of tax above this point. While this would be less progressive than the current system, it would be simpler and could potentially provide better participation incentives.*"

From this comment we can infer that the result in Figure 4.2 is no accident. It reflects the policy aim of reducing taxes at high income levels. Unlike Brewer et al. (2008), who search for empirical evidence of high gross earnings elasticities, the rationalisation here is "simplicity". However, this ignores the "elephant in the room". A government seriously concerned to reduce complexity would begin with a revenue neutral reform that combined a more progressive PIT rate scale with the elimination of the LITO and ML, and would then move towards making FTBs universal. The government could also focus on raising additional revenue by reducing opportunities for tax avoidance at upper income levels, in order to avoid high PIT rates

It should be noted that a less progressive income tax implies a shift in the tax burden to women because they predominate at lower earnings levels. Unless it is the intention of government to hold the earnings of women below the zero rated threshold, or slightly above it in poorly remunerated part time work, the suggestion that flattening the rate scale could potentially provide better participation incentives does not fit the data.

4.2 Medicare Levy and Family Tax Benefits

This section illustrates the structure of tax rates when the ML and FTB-A and FTB-B are combined with the PIT rate scale and LITO for the case of a family with two

children under 13, one under 5.[40] As noted earlier, rates vary not only with demographic characteristics, but also with the distribution of income between partners because both the ML exemption and FTB-A are withdrawn on joint income. We therefore present results separately for the single-earner family and then show what happens when the second partner goes out to work.

Single-earner family

The MTR scale created by adding the ML[41] to the PIT and LITO is shown in Table 4.2. At $34,571, the lower income limit of the exemption for the two-child family, the MTR rises to 10 cents in the dollar. The ML increases the number of tax bands to nine and introduces a MTR of 44 cents in the dollar on incomes from $34,572 to $40,671, the income level at which the exemption is fully withdrawn. This 44 cent rate is followed by a 35.5 cent rate and then a 31.5 cent rate. We see a further rise in MTRs across the "middle".

Table 4.2 MTRs: single-earner family

Taxable Income	MTR (PIT+LITO+ML)
$0 - $14,000	0.00
$14,001 - $30,000	0.15
$30,001 - $34,000	0.19
$34,001 - $34,571	0.34
$34,572 - $40,671	0.44
$40,672 - $60,000	0.355
$60,001 - $80,000	0.315
$80,001 - $180,000	0.415
$180,000 +	0.465

Family tax benefits have a more profound effect of the same kind on the profile of MTRs, as shown in Table 4.3. A MTR of 55.5 cent in the dollar applies across a middle income band of $42,600 to $60,000 followed by 51.5 cents in the dollar up to

[40] FTB-A provides a cash transfer of $4,631.83 per child under 13 years. The "maximum rate" is withdrawn up to the "base rate" on family income above $42,559 at a rate of 20 cents in the dollar. The base rate is $1945.45 and is withdrawn at a rate of 30 cents in the dollar on joint income above $98,112. FTB-B is a cash transfer of $3,693.80 for a child under 5 and is withdrawn on second earner's income above $4,526.0 and is fully withdrawn at $22,995. Since 1 July 2008 it has been limited to families in which the primary earner has an adjusted taxable income of $150,000 or less.

[41] The ML is a flat rate tax of 1.5 per cent above a joint income targeted exemption. When the family's income reaches the lower income threshold for the exemption, it is withdrawn at a rate of 10 cents in the dollar. For a family with two dependent children, the threshold is $34,571. There is also a surcharge at a higher income level for those without the required level of private health cover, which we omit here. The private health insurance tax rebate is also omitted.

an income of $69,423, due to the withdrawal of FTB-A above the "base rate" at a rate of 20 cents in the dollar. The progressive rate scale of the PIT has now been replaced by one that exhibits an inverted U-shape up to an income of $80,000. At $98,112 the MTR rises to 71.5 cents in the dollar due to the withdrawal of the base rate at 30 cents in the dollar. At $150,001 there is a MTR spike, denoted by *, due to the withdrawal of FTB-B at that income.

Table 4.3 MTRs and ATRs: Single-earner family

Taxable income	PIT+LITO+ML+FTBs	
	MTR	ATR
$0 - $14,000	0.00	-0.926
$14,001- $30,000	0.15	-0.352
$30,001 - $34,000	0.19	-0.288
$34,001 - $34,571	0.34	-0.278
$34,572 - $40,672	0.44	-0.17
$40,673 - $42,559	0.355	-0.147
$42,600 - $60,000	0.555	0.057
$60,001 - $69,423	0.515	0.119
$69,424 - $80,000	0.315	0.145
$80,001 - $98,112	0.415	0.195
$98,113 - $111,082	0.715	0.256
$111,083 - $150,000	0.415	0.297
$150,001	*	0.322
$150,002 - $180,00	0.415	0.337
$180,00 +	0.465	-

ATRs (calculated at upper income thresholds) are progressive. We have a negative income tax system for the single-earner, two-child family up to around $54,000.

Two-earner family

Since MTRs and ATRs faced by a second earner depend on the primary earner's income, we report results for selected primary income levels. Table 4.4 lists the tax rates on the income of the second earner in a family in which the primary earner's income is $40,000 pa. Table 4.5 gives the rates for a primary income of $50,000.

Given a primary income of $40,000, the second earner faces a MTR of 10 cents in the dollar on the first $672 of her earnings because the family's joint income is still within the withdrawal range of the ML exemption. Thereafter her MTR falls to the ML rate of 1.5 cents in the dollar until the lower joint income threshold of $42,559 for FTB-A is reached. At this point the second earner's MTR rises to 21.5 cents. At $4,526 her MTR rises to 41.5 cents in the dollar due to the withdrawal of FTB-B. From $14,000 the 15 cents in the dollar rate of the PIT scale applies and so the MTR

rises to 56.5 cents in the dollar. At $22,995, FTB-B is fully withdrawn and so the MTR falls to 36.5 cents. At $29,423, FTB-A is fully withdrawn, leaving the combined PIT and ML rate of 16.5 cents in the dollar. The MTR then rises by 4 cents in the dollar at $30,000 due to the withdrawal of the LITO. Finally, at $34,000 the rate returns to 35.5 cents in the dollar, the sum of the PIT and ML rates. When the second earner reaches $40,000, the ATR on her income is still close to 40 per cent due to high MTRs at lower income levels.

Table 4.4 Primary income of $40,000: Tax rates on second income

Taxable income	Tax rates on second earnings	
	MTR	ATR
$0 - $672	0.10	0.01
$673 - $2,559	0.015	0.038
$2,560 - $4,526	0.215	0.114
$4,527 - $14,000	0.415	0.318
$14,001 - $22,995	0.565	0.415
$22,996- $29,423	0.365	0.404
$29,424 - $30,000	0.165	0.40
$30,001 - $34,000	0.205	0.377
$34,001 - $40,000	0.355	0.373

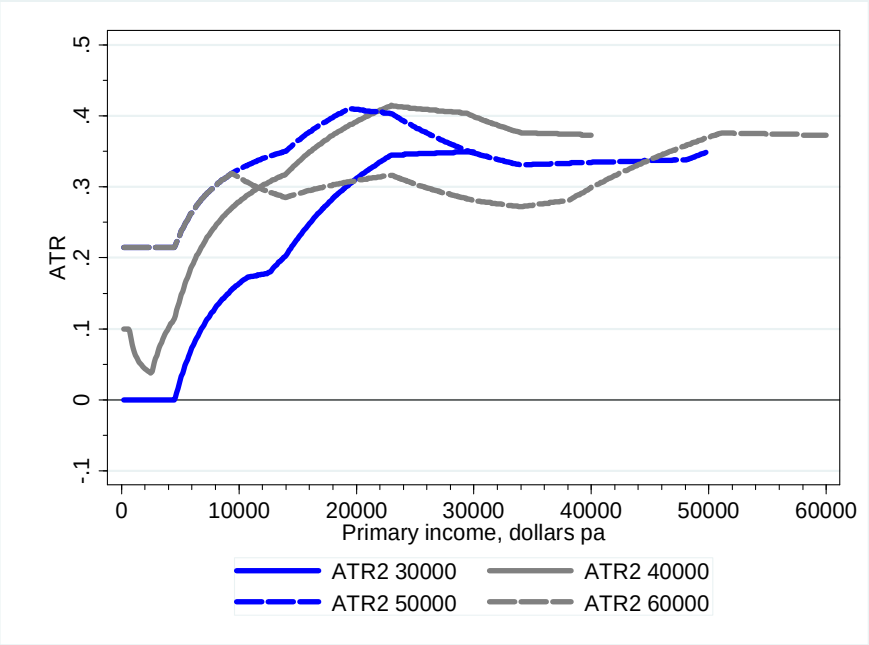
Table 4.5 Primary income of $50,000: Tax rates on second income

Taxable income	Tax rates on second earnings	
	MTR	ATR
$0 - $4,526	0.215	0.215
$4,527 - $14,000	0.415	0.35
$14,001 - $19,423	0.565	0.41
$19,424 - $22,995	0.365	0.403
$22,996 - $30,000	0.165	0.348
$30,001 - $34,000	0.205	0.331
$34,001 - $48,112	0.355	0.338
$48,113 - $50,000	0.655	0.35

In a family with a primary income of $50,000, the MTR on the first dollar of the second income is 21.5 cents due to the withdrawal of FTB-A and the ML. The rate rises to 41.5 cents at $4,526 with the withdrawal of FTB-B. It then rises to 56.5 cents in the dollar at $14,000, the zero rated threshold of the PIT plus LITO. Again, at an income of around $23,000, the second earner loses over 40 per cent of her earnings. At $48,112 the base rate of FTB-A begins to be withdrawn and so her MTR rises to 65.5 cents in the dollar, and her ATR begins to rise again.

Figure 4.3 plots the ATR profiles faced by the second earner for four levels of primary income: $30,000, $40,000, $50,000 and $60,000 pa. The graph shows that in all four cases, the second earner reaches high ATRs at relatively low income levels. Note that for families with more than two dependent children, the results are more extreme because the withdrawal rates apply across wider bands of income, and so ATRs are higher.

Figure 4.3 ATRS on second income at selected primary income levels, 2008-09



Taxes on second earners and their families at the levels indicated, together with a lack of access to affordable, high quality childcare, can be expected to have strong negative effects on female labour supply, not only during the child rearing years but throughout the entire life cycle, as indicated by the data on labour supplies reported for the life cycle phases in Section 3.1.

4.3 Further graphical comparisons

Raising ATRs on the second income, by withdrawing family payments on the basis of joint income or the income of the second earner, has the effect of shifting the tax

burden to two-earner couples. The following graphical analysis illustrates this outcome. The analysis compares marginal and average tax rates faced by the primary and second earner in a household that changes "type", by changing the labour supply of the female partner as second earner. For the purpose of simplifying the exposition, we take the limiting case of a household in which the second earner works full time and earns the same income as the primary earner. We are therefore comparing rates for the following two household types:[42]

- **Type SE:** Single-earner household in which the male partner works full time in the market and the female works full time at home
- **Type FT:** Two-earner household in which both partners work full time in the market.

Under a progressive individual based income tax the primary earner in both household types and the second earner with the same income as the primary earner in the FT household all face the same MTRs at any given level or primary income. Thus the MTR profile for the PIT rate scale and LITO in Figure 4.1a, and the ATR profile in Figure 4.1b, apply to the incomes of each employed partner. As noted earlier, while each employed partner faces the same MTR and ATR at any given level of earnings, the FT household pays twice as much tax as the SE household at that level.

The impact of the ML and FTB system is shown graphically by the differences between the profiles for the PIT scale and LITO in Figures 4.1a and 4.1b and those depicted in Figures 4.4a and 4.4b. Figure 4.4a plots the MTRs faced by the primary earner before the second earner goes out to work, and is denoted by MTR SE. Note that the figure plots the rates reported in Table 4.4. The figure also plots the MTR of the second earner at each level of primary income and is denoted by MTR2. Figure 4.4b plots the ATR profile of each household type, denoted by ATR SE and ATR FT, respectively. The ATR on the income of the second earner, calculated as the ratio of additional tax to additional income due to her labour supply decision, is denoted by ATR2.

[42] For a comparison of tax rates on primary and second incomes that includes households with the second earner in part time employment, see Apps and Rees (2009, Ch 6).

Figure 4.4a MTRs: PIT+LITO+FTBs+ML by primary income

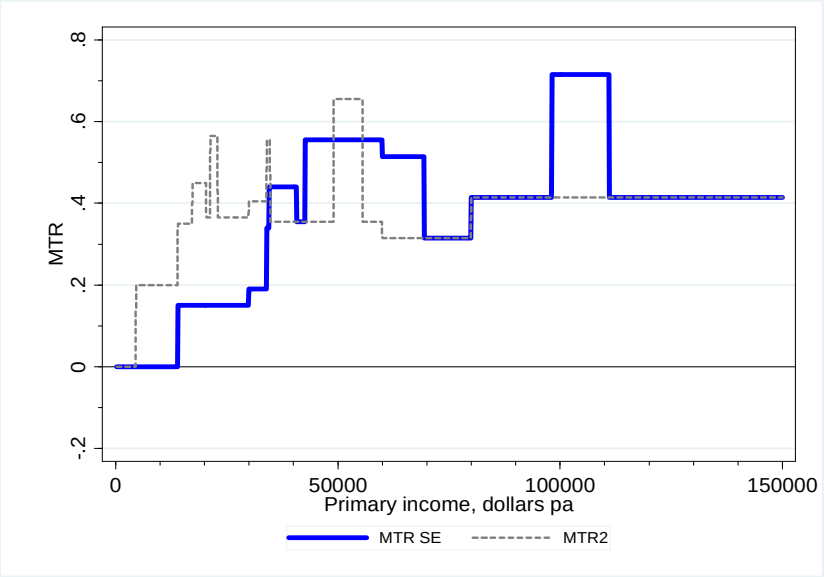
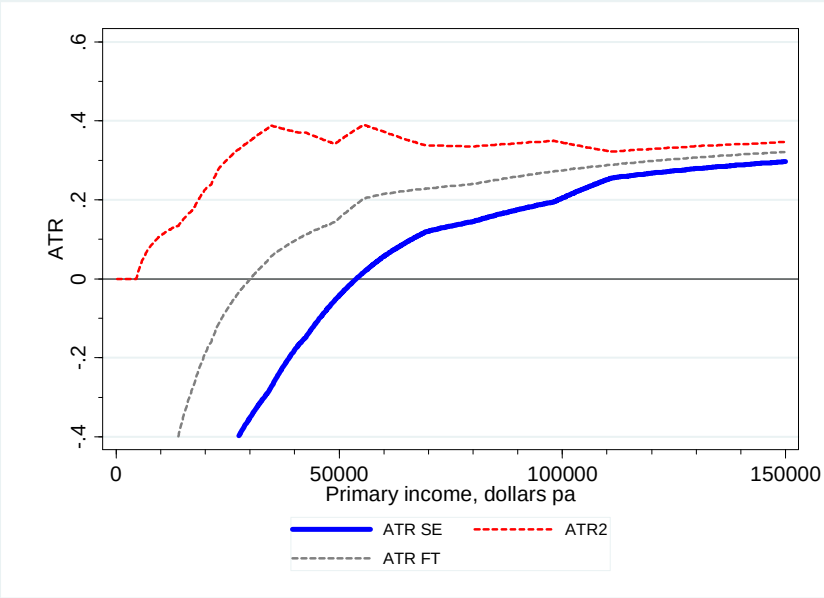


Figure 4.4b ATRs: PIT+LITO+FTBs+ML by primary income

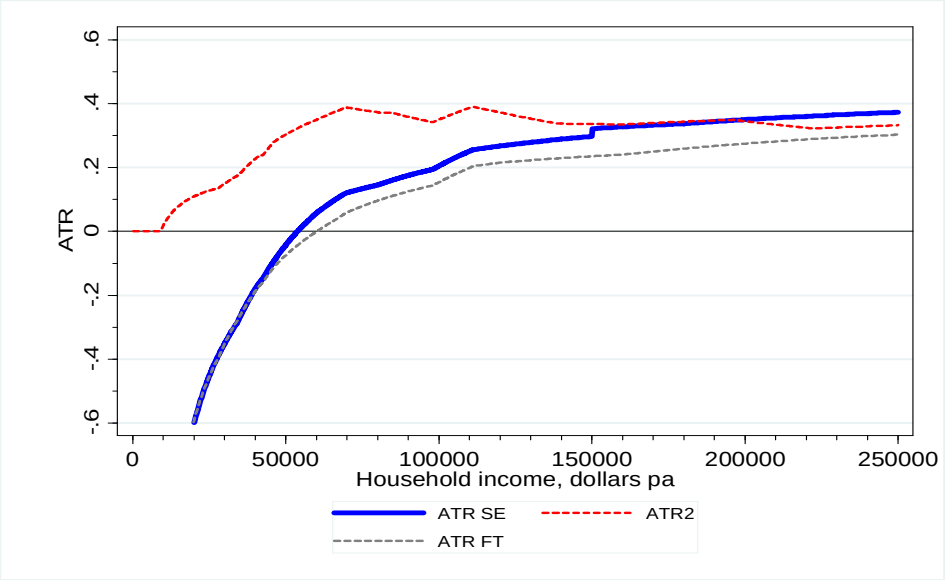


The new MTR profiles exhibit two striking features. First, the effect of combining the ML and FTBs with the PIT scale and LITO is a shift in the MTR profile of the second earner to the left. This is a characteristic feature of joint taxation. Second, marginal rates in the "middle" are much higher – there is a much stronger tendency towards an inverted U-shaped rate scale up to the lower income threshold for the withdrawal of base rate of FTB-A The consequences of both are very high ATRs on the income of the second earner at relatively low primary and second income levels. Overall, the higher ATR on the second earnings raises the ATR of the FT household

well above that of the SE household. At any given level of primary income, the two-earner family now no longer pays twice as much tax but more than twice as much tax as the single-earner with the same primary income.

To give an indication of the extent to which Australia has moved towards a system of joint taxation, Figure 4.5 plots ATRs with respect to household income. Under a system of full joint taxation, ATR profiles with respect to household income will be identical for the two household types. The figure therefore shows that up to around the point at which the base rate of FTB-A is fully withdrawn, the system very closely approximates one of joint taxation.

Figure 4.5 ATRs: PIT+LITO+FTBs+ML by household income



4.4 Empirical analysis of impact on working families

We now turn to an empirical analysis of the impact of this type of tax rate structure on families "in-work" using the ABS SIH06 data sample described in Section 3.2. All incomes are indexed to the 2008-09 financial year. Following the approach of the preceding section, the tax burden on the primary earner is calculated as the tax the family would pay if it had only one earner. The burden on the second earner is then calculated as the increase in the family's tax burden when her earnings are included in family income. We present results for the three household types: single-earner (SE), two-earner with the second in part-time work (PT), and two-earner with both partners

in full time work (FT). As indicated in Table 3.3, the three types tend to be fairly evenly distributed across quintiles, apart from a slight tendency for two-earner households to predominate in the middle quintiles.

Table 4.6 reports ATRs on the household income of each type and on the second income of the PT and FT households, by quintiles of primary income. The overall data means in the final column show that, on average, primary earners in the SE household pay $8,150 in tax. The PT household's tax is close to double that figure, at $14,492, because, on average, the second earner pays $6,600 on an income of only $22,911. The tax burden on the FT household is $20,613, with the second earner contributing $12,613. While all second earners face high ATRs, the highest rates appear in quintile 1. These results are broadly consistent with the effect of targeting on joint income illustrated in Table 2.8b.

Table 4.6 Tax burdens by primary income, 2008-08 $pa

Quintiles of primary income	**1**	**2**	**3**	**4**	**5**	**All**
SE						
Net tax $pa	-8737	-1415	3121	9169	33718	8150
ATR %	**-22.4**	**-2.5**	**4.4**	**15.5**	**22.9**	**9.5**
PT						
Second earnings $pa	18090	21546	22781	22826	29727	22911
Tax on second earnings $a	5997	6267	6183	6248	8456	6600
ATR2 %	**33.2**	**29.1**	**27.1**	**27.4**	**28.4**	**28.8**
Net household tax $a	-1246	6158	9738	16312	43309	14492
ATR %	**-2.3**	**10.8**	**15.9**	**19.3**	**24.2**	**17.5**
FT						
Second earnings $pa	24532	31969	38914	45919	65941	41342
Tax on second earnings $a	7599	9332	10680	13831	20527	12311
ATR2 %	**31.0**	**29.2**	**29.9**	**27.4**	**31.1**	**29.8**
Net household tax $a	1001	9874	15565	24636	53495	20613
ATR %	**1.7**	**10.8**	**15.9**	**19.3**	**24.2**	**17.5**

ATRs on the second income at the levels indicated mean that, on average, a married mother who decides to go out to work will lose around a third of her income in taxes and reduced FTBs.[43] She will also contribute more to GST revenue, because her additional income will be spent at least partly on GST rated goods and services bought as substitutes for those she could produce herself by working full time at home. Moreover, if she decides *not* to go out to work, and all mothers make the same

[43] Note that the losses will be greater if the family has more than the average number of children (see Table 3.2).

decision, tax revenue from families could fall by almost 50 per cent. Over time, the revenue from all couples in the post-child phase can be expected to fall, given the evidence on persistence of the female labour decision make in the pre-school phase of the life cycle.[44]

5 Conclusions

In this paper we have shown how Australia's progressive individual income tax has been transformed into a system with strong elements of joint taxation and a rate scale that is no longer progressive. The overall effect of the transformation has been to shift the tax burden from the top of the income distribution to the lower and middle income ranges, and in particular to working married women in these income ranges. The paper attributes the motivation for this direction of reform to an ideological position, prevalent since the 1980s, that exaggerates the mobility of top income earners and the effects on their incentives to earn income of tax rates which place upon them a fairer share of the overall tax burden. The drive to reduce taxes at the top, and the need to deal with in-work poverty of families at the bottom of the income distribution, has resulted in a set of changes to the Australian tax system which cannot be justified on the grounds of either fairness of the distribution of tax burdens or the effects on work incentives and economic efficiency.

The central policy proposal of this paper is the reintroduction of a progressive individual based income tax combined with universal family payments, together with the elimination of unnecessary policy instruments, such as the LITO and ML, that serve only to reduce transparency of the true rate scale. The paper sets out at some length the merits of a progressive individual income tax in a modern economy. While the majority of families now have two-earners, there is a high degree of heterogeneity in the labour supply of the second earner. It is therefore essential to evaluate the effects of tax reform within the framework of a model that recognises the multi-person household as a small economy engaged, to varying degrees, in intra-household production (predominantly of child care) and exchange. The relevance of the single-

[44] For an estimate of the potential revenue gains from switching to a progressive individual income tax and universal family payments, see Apps (2007).

person household model, in which a representative individual makes a choice between work and leisure in a perfectly competitive labour market, and inter-temporal consumption and saving decisions in a perfect capital market, has long since passed.

Section 3 explained at some length the superiority of a progressive individual income tax over joint taxation, or indirect taxation. Neither an income tax nor a consumption tax can be applied to a tax base that includes household production. Households with the same wage rates and demographic characteristics will therefore pay different amounts of tax, depending on the second earner's choices between market and domestic work. Under these conditions, individual taxation is a less constrained policy instrument for redistribution. Progressive individual taxation, in addition to being consistent with the Ramsey rule for efficiency, has merits in terms of horizontal and vertical equity, because the tax a household pays will be negatively correlated with the dispersion in partners' incomes, and therefore positively correlated with the allocation of time to home production. Joint taxation has the opposite effect. Indirect taxation offers no solution because individual consumptions within the household are not observed. The base for indirect taxation is inevitably limited to joint consumption or some essentially arbitrary assumption about unobserved consumption shares within the household. Australia therefore needs to move to a tax system centred more heavily on a well-designed progressive individual income tax, together with reforms that address the widespread problem of tax avoidance.

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Appendix A

Section 2 shows how an income test on a universal transfer funded by a linear or piecewise linear income tax has the effect of changing the MTR scale while leaving the universal transfer in place. More generally, in a linear, or piecewise linear, tax system the amount of tax an individual pays on a given gross income can be written

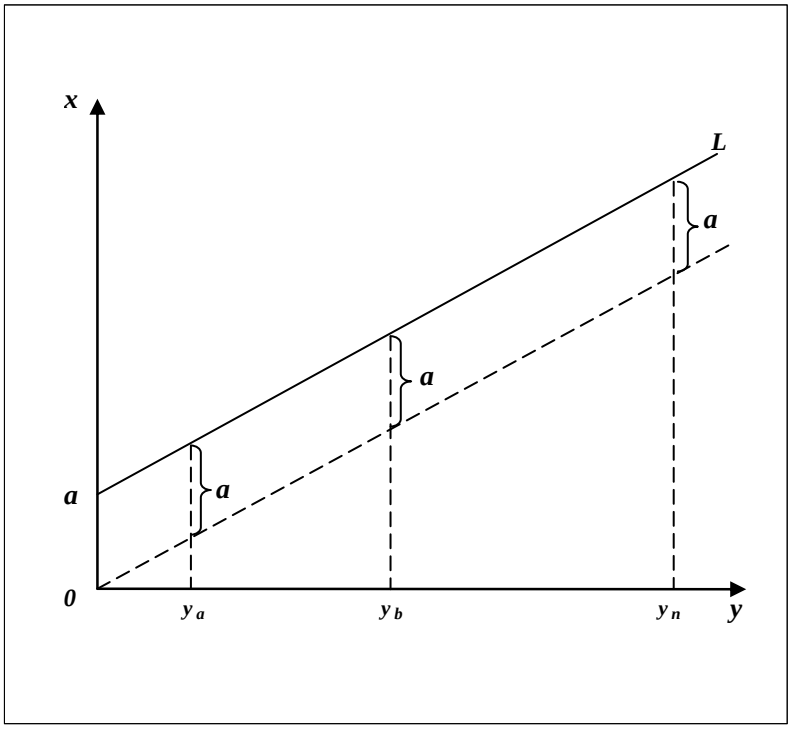
as a function of just two tax parameters: a *lump sum* and a *marginal rate*. This is an important point in the light of the often confused discussion of "churn" (see Australian Treasury, 2009), and so we show it in the context of a detailed example.

Figure A1 illustrates the structure of a linear income tax. The figure plots net income, x, as a function of gross income, y, for a set of households with differing income levels, $0 \leq y \leq y_n$. The universal transfer is denoted by a. The household's net income after tax and transfer is given by the function

$$x = a + (1 - t)y$$

and is represented by the line aL.[45] The slope of the line is $(1 - t)$, where t denotes the MTR. A household with $y = 0$ is completely dependent on a.

Figure A1 Linear income tax

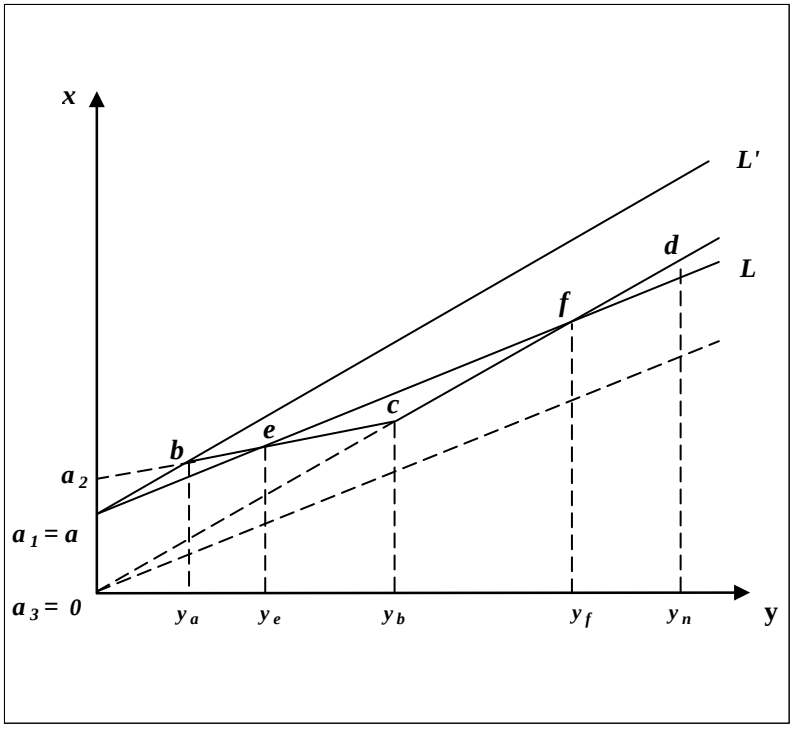


Now consider what happens when the government decides to withdraw the universal transfer a on incomes above the level y_a at a rate r and *to use the revenue "saved" to cut the tax rate from t to t'*, while keeping total tax revenue the same. Income above y_a is taxed at the rate $t' + r$ until an income level is reached at which the additional tax

paid, $r(y - y_a)$, exactly equals a. Denoting this income level by y_b we have $y_b = y_a + a/r$. The MTR is no longer constant across incomes but has an inverted U-shaped profile - the higher rate, $t' + r$, applies over the "middle" income range and the lower rate, t', to the bottom and top income ranges.

This is illustrated in Figure A2. Households with incomes in the range $[0, y_a]$ receive a and pay the tax rate t'. Those with incomes in the range $[y_a, y_b]$ receive a, pay t' on their incomes up to y_a, and $t' + r$ on their incomes $y - y_a$. Finally, households in the range $[y_b, y_n]$ receive a, pay t' on their incomes up to y_a, $t' + r$ on their incomes $y_b - y_a$, and t' on their incomes $y - y_b$. The linear tax represented by the line aL has been replaced by the piecewise linear tax resulting in a budget constraint corresponding to the kinked line $abcd$ in Figure A2.[46] The line aL' in this figure represents a linear income tax with the same transfer but the lower marginal tax rate, $t' < t$, so that along it $x = a + (1 - t')y$. It obviously generates less tax revenue than aL.

Figure A2 Non-convex piecewise linear income tax



[45] We can think of this line as defining a budget constraint for every household in the *(y, x)* - plane. Since the implied set of feasible *(y, x)* - pairs, the budget set, is a convex set, this is an example of a convex tax system.

[46] Thus *abcd* results in a non-convex budget set. The distinction between the convex and non-convex cases is very important when analysing optimal piecewise linear tax systems. See Apps, Long and Rees (2009) and Apps and Rees (2009).

The new tax system can be described by the functions

$x = a + (1 - t')y \qquad y \leq y_a$

$x = a + (1 - t')\, y_a + [1 - (t' + r)](y - y_a) \qquad y_a < y \leq y_b$

$x = a + (1 - t')\, y_a + [1 - (t' + r)](y_b - y_a) + (1 - t')(y - y_b) \qquad y > y_b$

The policy, however, is equivalent to introducing a "menu" of three different linear income tax systems, each defined by a *lump sum* and *marginal rate* as follows:

$x = a_1 + (1 - t_1)y \qquad y \leq y_a$

$x = a_2 + (1 - t_2)y \qquad y_a < y \leq y_b$

$x = a_3 + (1 - t_3)y \qquad y > y_b$

where: $a_1 = a$

$a_2 = a + (t_2 - t_1)\, y_a$

$a_3 = a + (t_2 - t_1)\, y_a + (t_3 - t_2)y_b + (1 - t_3)y = a - r(y_b - y_a) = 0$

and $t_1 = t'$, $t_2 = t' + r$ *and* $t_3 = t'$. Households with an income below y_e are better off, (the budget line *abe* lies above *aL*), those with an income in the interval $[y_e, y_f]$ are worse off (the budget line *ecf* lies below *aL*), and those with incomes above y_f are better off (the budget line *fd* lies above *aL*) by an amount that rises with their income level.

In the example of the linear income tax in Section 2.1, we have:

y_e = \$20,000 and y_f = \$100,000.

The MTRs are:

t_1 = 12.5%, t_2 = 37.5%, and t_3 = 12.5%,

and the lump sums are:

a_1 = \$20,000, a_2 = \$25,000, and $a_3 = 0$.

The lump sum a_2 is the sum of the \$20,000 universal transfer and the additional tax that would be payable if the individual had paid t_2 on all income. The lump sum a_3 is the sum of the \$20,000 universal transfer less the additional tax paid due to the higher MTR of 37.5 cents in the dollar on income from \$20,001 to \$80,000 (i.e., \$20,000 - \$80,000*(0.375-0.25)=\$0).

The post-reform distribution of MTRs and lump sums across income quintiles is shown in rows 1 and 3 of Table A1. Row 2 gives the amount of tax the representative individual in each quintile would pay if the MTR on the individual's last dollar applied to all income.

Table A1 Post-reform: Lump sums and MTRs

Annual income $pa	**20,000**	**40,000**	**60,000**	**80,000**	**200,000**
1. MTR%	12.5	37.5	37.5	37.5	12.5
2. MTR*income	2,500	15,000	22,500	30,000	25000
3. Lump sum	20,000	25,000	25,000	25,000	0

It is always possible to find a tax rate schedule such as *abcd* which, by choosing a lower basic tax rate and withdrawing the universal benefit at an appropriate rate from an appropriate threshold, will redistribute income from the middle to the top and bottom while raising the same tax revenue.

It is straightforward to show that it is also possible to do this when the pre-reform income tax is convex piecewise linear, that is, when the MTR scale is progressive rather than a constant, as in the progressive rate scale of *Example 2* in Section 2.1. In the example there is no gain for the bottom – only the top gains. The system is again defined by a set of three lump sums and MTRs, which are distributed across income quintiles as shown in Table A2. For the representative individual in quintile 1, the MTR is zero and the lump sum is equal to the transfer of $20,000. In quintiles 2 to 4, the MTR is 25 cents in the dollar and the lump sum is $25,000 ($20,000 plus $5,000 due to the zero rated threshold). In quintile 5, the MTR is 50 cents in the dollar and the lump sum is $50,000.

Table A2 Piecewise linear income tax: lump sums and MTRs

Annual income $pa	**20,000**	**40,000**	**60,000**	**80,000**	**200,000**
1. MTR %	0.0	25.0	25.0	25.0	50.0
2. MTR*income	0.0	10,000	15,000	20,000	100,000
3. Lump sum $pa	20,000	25,000	25,000	25,000	50,000

The income-test under the reform replaces the pre-reform convex piecewise linear income tax with a non-convex piecewise linear system. The new set of lump sums and MTRs are distributed across income quintiles as shown in Table A3.

Table A3 Post reform: lump sums and MTRs

Annual income $pa	20,000	40,000	60,000	80,000	200,000
1. MTR %	0.0	37.5	37.5	37.5	25.0
2. MTR*income	0.0	15,000	22,500	30,000	50,000
3. Lump sum $pa	20,000	27,500	27,500	27,500	-15,000

Appendix B

Table B.1 lists the PIT rate scale and combined PIT and LITO marginal rates for 2007-08 and those proposed for 2010-11, and the Government's "aspirational" PIT rate scale and LITO for 2013-14.

Table B.1 MTRs: 2007-08, 2010-2011, 2013-2014

Taxable Income	MTR	Taxable Income	MTR + LITO
2007-08			**(LITO $750)**
$0 - $6,000	0.00	$0 - $11,000	0.00
$6,001 - $30,000	0.15	$11,001 - $30,000	0.15
$30,001 - $75,000	0.30	$30,001 - $48,750	0.34
$75,001 - $150,000	0.40	$48,751 - $75,000	0.30
$150,000 +	0.45	$75,001 - $150,000	0.40
		$150,000 +	0.45
2010-11			**(LITO $1500)**
$0 - $6,000	0.00	$0 - $14,000	0.00
$6,001 - $37,000	0.15	$14,001 - $30,000	0.15
$37,001 - $80,000	0.30	$30,001 - $37,000	0.19
$80,001 - $180,000	0.37	$37,001 - $67,500	0.34
$180,000 +	0.45	$67,501 - $80,000	0.30
		$80,001 - $180,000	0.37
		$180,000 +	0.45
"Aspirational" 2013-14			**(LITO $2100)**
$0 - $6,000	0.00	$0 - $20,000	0.00
$6,001 - $37,000	0.15	$21,001 - $30,000	0.15
$37,001 - $180,000	0.30	$30,001 - $37,000	0.19
$180,000 +	0.40	$37,001 - $82,500	0.34
		$82,501 - $180,000	0.30
		$180,000 +	0.40